MUNICIPAL 3Rs INFRASTRUCTURE:

A REFERENCE GUIDE

INTERNATIONAL CASE STUDIES

MARCH 1994

Ministry of
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John Thomas	The Municipal Engineers Associations, (Borough of East York)
Linda Varangu	Association of Municipal Recycling Co-ordinators Association of Municipalities of Ontario
Neal Ahlberg	Ontario Ministry of Environment and Energy, Chair

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Section 1

Purpose

1.0 PURPOSE

In recent years, municipalities and businesses across Ontario have fundamentally changed their attitudes towards wastes. Rather than simply landfilling the residue from various products and activities which comprise our consumer lifestyle, wastes are being redefined as resources which have been poorly managed.

Improving our management of resources has become an environmental and economic necessity during recent years. Both public and private sector operations are increasingly implementing more efficient processes, specifying reused or recycled content during procurement of supplies and ensuring that materials that are surplus to their operations are redirected for reuse and recycling. Municipalities, in their role as suppliers of essential services, have provided opportunities for recycling and composting of household waste, as well as public education programs encouraging reduction of waste at the source and proper management of household hazardous waste.

Attention to resource use and waste generation and a gradual trend towards improved management of secondary resources have combined to contribute to achieving the 1992 waste diversion goal of 25%. Reaching, or perhaps even exceeding, the next goal of at least 50% waste diversion remains our collective challenge. While much has already been accomplished, it is increasingly apparent that additional information, creative approaches and technological innovation are necessary to advance waste reduction, reuse and recycling (3Rs) in Ontario.

Recognizing the advancements in 3Rs activities being made worldwide, the Ministry of Environment and Energy (MOEE) established a multi-disciplinary task force to examine, among many other items, a format for compiling pertinent information on progressive 3Rs initiatives in other communities. The Municipal 3Rs Infrastructure: A Reference Guide is designed to provide information on options that may be of interest to Ontario municipalities and businesses. In identifying options to be reviewed in the first edition of the Guide, representative examples of the most promising approaches, systems and programs which are at or beyond current Ontario experience and are worthy of expansion or emulation have been selected.

In recognition of the size, scope and complexity of the province, selection and review of items has been completed with specific attention to meeting the varied needs of Ontario municipalities.

Section 2

How to Use This Guide

2.0 HOW TO USE THIS GUIDE

The Municipal 3Rs Infrastructure: A Reference Guide has been designed to provide key information in an easy reference format. Standard section titles, using terms and phrases already common among Ontario municipalities, have been used including:

- public education,
- source reduction,
- reuse,
- dry recyclables,
- organics,
- household hazardous waste (HHW), and
- full systems.

Within these sections, information on each item being reviewed is presented in a distinct sub-section complete with related references and contacts. Use of a case study format, focusing on specific programs or jurisdictions, was considered to be the most effective method of presenting practical and helpful information. Future expansion of the Guide by the MOEE can therefore be accommodated by simply inserting additional "stand alone" case studies in the sub-sections.

Available information on each item is presented using the following categories and subsections wherever possible:

General Overview

- Case Study/Subject Jurisdiction
- Demographics
- Political/Social Factors
- Driving Forces

Detailed Description

- Specific Features
- Waste Types and Sources
- Municipally or Privately Operated
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- Government Regulations/Standards
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Research References

While common performance parameters were used in researching each option, the level of information available was inconsistent and, in the case of certain items, not relevant. In presenting information within the Guide, sub-section headings not relevant to a particular option (e.g. Industry Standards in the sub-section Public Education and Promotion) have been deleted. Others, considered relevant, but for which no information was available, remain within the text with the added notation "Information requested but not provided or available". The review of options included in the Municipal 3Rs Infrastructure: A Reference Guide is not considered to be exhaustive. Rather, it is intended to provide a general but reasonably complete representation of the key aspects and issues related to particular options. Recognizing that application of any option will require adaptation and modification to the needs of a particular municipality or business, key contact names, addresses and telephone and fax numbers

have been provided to allow users of the Guide to pursue more specific information needs.

For ease of use, currency and weight information presented within the Guide has been adjusted to Canadian dollars and metric tonnes. Appendix E provides the exchange rates used during development of the Guide. Every effort has been made to ensure that the most current cost data have been referenced in the Guide. However, costs have not been adjusted for inflation or changes in the international values of currency which may have occurred since the data were developed or prepared for inclusion in this guide (summer 1993).

The Guide is also available in electronic format on 3.5 inch high density disks.

The Municipal 3Rs Infrastructure: A Reference Guide represents progressive and promising examples of 3Rs activities from a range of jurisdictions. It is important to recognize that this information represents the current state of the art on these options. In the rapidly changing 3Rs field, it is recognized that the information contained in this Guide may require updating in the years to come.

Section 3

Public Education and Communications

3.0 PUBLIC EDUCATION AND COMMUNICATIONS

3.1 Approaches and Strategies for Citizens

3.1.1 Public Education and Promotion - Profile # 1

General Overview

The Minnesota Office of Waste Management (OWM) conducted a research project designed to quantify packaging waste of 15 grocery store products. The Smart Shopping (Saving Money and Reducing Trash) program incorporated this waste quantification information and related cost differences of product packaging into a multi-faceted public education campaign. In developing this public education campaign, the OWM cooperated with the Minnesota Grocers Association and other interested grocers. The campaign was developed with their advice, and in cooperation with local cities, counties, and civic organizations in order to expand the education community-wide.

Case Study / Subject Jurisdiction:

Smart Shopping pilot in Cub Foods store, Eagan, and Cash Wise Foods, Willmar, MN

Demographics

Information requested but not provided or available.

Political/ Social Factors

The project was undertaken to meet a legislative mandate of the OWM (Minnesota Statute 115A.072, 1990) to develop a statewide campaign to educate Minnesota citizens about waste management, with an emphasis on source reduction of waste.

Driving Forces

- The Minnesota Office of Waste Management was directed by legislation to develop a statewide education program to provide information that communities could adapt for local use.
- The main focus of the campaign is consumer education on source reduction, with information materials to be placed initially in grocery stores around Minnesota.

Detailed Description

The OWM's original research measured the volume and weight of typical categories of packaging of grocery store products. To avoid measuring costs associated with different product manufacturers, packaging used for the analysis needed to be from the same name brand whenever possible. With few exceptions, products with more packaging were shown to be more expensive than their less-packaged counterparts.

Detailed Description (Cont'd)

Educational signs and printed materials show these comparisons, including:

- A series of seven posters.
- A brochure.
- "Buy Reusables" and "Buy in Bulk" signs.
- Source reduction tip cards/bookmarks.
- Shelf cards to be displayed where products are sold.

Various information and promotional materials were designed for use in:

Grocery stores

- Displays, brochures, posters, shelf talkers, tip cards.
- Recommendations for the use of volunteers and the role of grocery store staff were prepared.

Schools

- A customized school lesson "Quantifying Cost and Waste Savings of Grocery Store Products" was prepared.

Libraries, community centres

- Promotional material originally designed for grocery stores was adapted for use in other public locations.

The OWM started with campaign "kick-offs" at selected Minnesota supermarkets to test a variety of promotional materials and then determine where to make revisions to content and display approaches for these materials. Local media, television, radio and newspapers, were informed of the kick-off events through a news release and press kit mailing. OWM staff and volunteers were directly involved at the stores during the campaign kick-off, including staffing display tables, handing out brochures and related information, responding to general questions and surveying customers. In addition, store managers agreed to provide sales data for evaluation purposes.

Future plans for the Shop Smart campaign include maintaining the basic promotional information throughout 1993, in addition to seasonal materials like "School Smart Shopping" and "Holiday Smart Shopping". The OWM next plans to expand the Smart campaign into a "Toxics Reduction Campaign" in 1994.

Specific Features

Smart Shopping campaign pilot, which lasted one week, was conducted in the spring of 1992. In the summer of 1992, the program was introduced statewide. The basic promotional information is to be maintained throughout 1993.

Specific Features (Cont'd)	Techniques used to measure packaging waste: - Grocery products were selected because virtually everyone uses grocery stores and is familiar with their products. - Packaging waste that must be managed by the consumer was the focus of this assessment. - Different types of packaging produced by the same brand owner were analyzed for each of the 17 products chosen. - Scope of the study did not include recyclability. - The study did not attempt to factor "convenience" as it was determined to be too subjective for consistent measurement. - Costs were calculated per ounce of product. - Two electronic scales were used (containers were not washed after emptying). - Volume was measured by using a ruler or water displacement method. - Mainstream supermarkets were targeted because most people are familiar with these stores and their products.
Waste Types and Sources	Grocery products packaging waste.
Operational Responsibility	Operated by the Minnesota Office of Waste Management.
Contractual Arrangements	Information requested but not provided or available.
Role/ Requirements of Resident, Private/ Public Sectors	- Initiated by state government. - With co-operation of individual grocery stores and industry association. - Ultimate success of the program depends on the response and involvement of residents to make "Smart Shopping" choices.
Public Education/ Promotion/ Training	The program involved staff education and training: - Materials have been printed in large quantities and packaged for free distribution to county solid waste staff. - OWM staff prepared an implementation packet and slide show to demonstrate their experience from the trial runs. - Orientation sessions were conducted in nine regions statewide to train local waste management staff and educators in order to encourage implementation of the campaign locally, - During the summer of 1992, the OWM worked with the Minneapolis Metropolitan Council on their Metro area source reduction education project. The Council approved funding for television ads promoting the message of source reduction and referring directly to the Smart Shopping campaign. Public education tools: - Fact sheets explaining the research methodology and findings in non-technical terms

Public Education/ Promotion/ Training (Cont'd)	- Promotional materials:
	  - Smart Shopping brochures (applicable in many settings).
	  - Poster set (reduce, reuse, recycle).
	  - Shelf talkers (3.5" x 5.5" cards illustrating the 17 products and research results)
	  - Tip cards (can be used at checkout stand and are also available as bookmarks).
	  - Hanging posters "Buy in Bulk" and "Use Reusables".
	  - Computer video game "Grocery Shopping".
	- Suggestions on how to incorporate the Smart Campaign in your community including:
	  - Role of staff and volunteers.
	  - Working with the media.
	  - How to set up and distribute materials.
	- Sample of OWM press kit.
	- Customized school lesson that educates students about waste reduction and leads them through the Smart Shopping research.
	- Brochure on designing and creating display panels (which are also available for rent).

Key Issues in Municipal/ Resident Acceptance	Information requested but not provided or available.
Applicability to North/South, Urban/Rural	Applicable to any type of community.

Financing and Economics

Operating Costs	State of Minnesota allocated $CND 190,000 for Smart Shopping pilot project (project's duration - one and half year). Staff costs are included in this figure.
Administrative Costs	2.5 full time positions for the period of the project.
Financing Arrangements/ Issues	Smart Shopping program was funded by the State of Minnesota.
Contractual Arrangements	Information requested but not provided or available.

Performance

Waste Diversion Impact	Information requested but not provided or available.

Observed/ Measured Impact on 3R Awareness, Participation

- After only one week, approximately 50% of the customers surveyed during the kick-offs were aware of an environmental campaign being conducted in the store.
- Of those customers, approximately 33% were able to recall without prompting part or all the theme of the campaign.
- A 12 question survey indicated that consumers continue to be concerned about the environment, especially regarding economic and environmental costs of packaging.
- The brochure, which was handed out at the store entrance during the pilot, was by far the most effective educational tool.
- Around 90% of customers claimed to be recycling on a regular basis.
- Television and newspaper were selected by those surveyed as the two most effective media in promoting Smart Shopping.

After two successful pilots, in the summer of 1992, the Smart Shopping campaign was introduced statewide including the distribution of:

- 140,000 original brochures.
- 100,000 school brochures.
- 100,000 holiday brochures.
- 5,000 Smart posters.
- 1,800 holiday posters.
- About 200 implementation folders.
- Many counties have reprinted brochures and posters, thus increasing the total number distributed.

Contacts

Governmental

Minnesota Office of Waste Management
1350 Energy Lane, Suite 201
St. Paul, Minnesota 55108
Jeff Ledermann
Waste Education
(612) 649-5737

Research References

Literature Sources

Information materials supplied by the Minnesota Office of Waste Management (1992 - 93)
Quantifying packaging waste at grocery stores - Resource Recycling, December 1992

Personal Communications

Minnesota Office of Waste Management
Jeff Ledermann
Waste Education

3.0 PUBLIC EDUCATION AND COMMUNICATIONS

3.1 Approaches and Strategies for Citizens

3.1.2 Public Education and Promotion - Profile # 2

General Overview

The Shop Smart program promotes waste reduction at the point of purchase in grocery stores by providing detailed information on consumer choices, organization of in-store events, involvement of volunteers and use of community media opportunities.

Case Study / Subject Jurisdiction:

The Shop Smart program in Seattle, Washington

Demographics

Community Type: Urban
Population: 512,000

Political/ Social Factors

City of Seattle's goal of 60% waste diversion by 1998; 2.5% to be achieved through waste reduction.

Driving Forces

City of Seattle's waste composition analysis determined that packaging waste represented a significant percentage of the waste stream and must therefore be addressed in order to reach waste reduction and diversion goals.

Detailed Description

The Shop Smart program encourages grocery store shoppers to choose:
- Minimal packaging.
- Packaging that can be recycled.
- Packaging that is made from recycled content.
- Products that can be used more than once.

Grocery stores were chosen as the program focus because:
- Grocery stores represent prominent locations where reduction of packaging waste could be demonstrated.
- The majority of people shop at the same grocery store on a regular basis. By focusing on a specified number of stores each year (1991 - 9 stores; 1992 - 7 stores; 1993 - 6 stores), the Shop Smart campaign became a recognizable theme to shoppers.
- Based on geographic distribution and degree of support from store management.
- The stores involved in the program were chosen to ensure that some participating stores were able to serve members of Seattle's ethnic communities.

Detailed Description (Cont'd)

- Volunteers from the Seattle Solid Waste Utility's Friends of Recycling and Master Composter Program completed a training program on packaging waste reduction.
- Volunteers, in teams of 2, staff Shop Smart store displays, events and tours. For example, 24 volunteers were used to cover the 9 stores targeted in 1992.

Specific Features

- Program started in 1991 and continues.
- The program mascot, Choosey, appears on shelf-talker signs throughout the store and other promotional material.
- Choosey also appears on canvas shopping bags used as give-aways to approximately 40 customers per month who agree to participate in a quiz.
- Shop Smart displays, staffed by trained volunteers, feature "Smart Choice" products and their over-packaged and/or non-recyclable counterparts.
- Pre-printed post cards and lists of manufacturers' addresses and toll free phone numbers encourage customers to register complaints or compliments about product packaging.
- Educational store tours are provided by trained volunteers.
- Labels on the bottom of "non-smart" choices indicate, by percentage, how much more these products cost than Shop Smart alternatives.
- Rebates for reusing bags were offered.
- Shelf tags with messages ranging from information on local curbside collection programs to messages encouraging certain actions, eg. "bring back your plastic produce bags to reuse the next time you shop".
- During the first four months of the 1992 campaign, there was a 14% average increase in bag reuse each month.

Waste Types and Sources

Food and household product packaging.

Operational Responsibility

Designed and implemented at the municipal level.

Contractual Arrangements

- In 1991 and 1992, a consultant was hired under contract to design and implement the program.
- In 1993, the program was provided using municipal staff.

Role/ Requirements of Resident, Private/ Public Sectors

- Public sector initiated, manages and funds program.
- Private sector (grocery store owners) provide co-operation and support of the program as well as participation in publicity e.g. promotion on grocery store bags, t-shirts for staff.
- Committed volunteers from residential sector provide direct educational benefit and personal contact at no cost to municipality.
- Ultimate success of the program depends on the response and involvement of residents to make "Shop Smart" choices.

Public Education/ Promotion/ Training

- Information about the various kick-off events was carried in the general community and neighbourhood media as well as being promoted by neighbourhood groups, organizations, participating stores, ethnic groups and organizations.
- Free cake and activities for children were included in each kick-off event.
- Invitations (printed on 100% post-consumer paper) were stuffed in customers' grocery sacks the week before the event.
- Approximately 80 people attended the Smart Shop kick-off at each store.

Key Issues in Municipal/ Resident Acceptance

- Program was generally well accepted.
- Especially successful when volunteers were present at the stores.

Applicability to North/South, Urban/Rural

Applicable to all communities for use in grocery stores or possible other stores selling consumer items e.g. hardware stores.

Financing and Economics

Operating Costs

- When consultants were used to design program (1991 and 1992), total costs were $CND 95,000 per year.

1992 budget (in $CND):

Labour (consultants and subcontractors)	$ 71,300
Supplies (billboards, canvas bags with imprints, promotional materials, etc.)	21,000
Travel	600
Rent	2,100
Total	$ 95,000

- In 1993, after the decision to conduct the program "in-house" was made, total costs are budgeted to be less than $CND 25,000 (including production of 2,000 canvas bags for $CND 7,600 and hiring of a consultant to train volunteers at $CND 10,000).

Administrative Costs

- Approximately 25% of an employee's time from municipal recycling division is devoted to this program.

Performance

Waste Diversion Impact

Information requested but not provided or available.

Labour Requirements

25% of municipal staff person plus volunteer work.

Contacts

Governmental

Carl Woestwin
Waste Reduction Project Manager
City of Seattle, Solid Waste Utility, Washington
(206) 684-4684 or
(206) 684-7666

Non-Governmental

Lee Benner
(206) 296-5645
Energy Extension Service (consultant)

Research References

Literature Sources

Preventing tomorrow's garbage today: waste reduction education
Resource Recycling, December 1992

Materials sent by Seattle Solid Waste Utility

Personal Communications

Carl Woestwin
Waste Reduction Project Manager
City of Seattle, Solid Waste Utility, Washington

3.0 PUBLIC EDUCATION AND COMMUNICATIONS

3.1 Approaches and Strategies for Citizens

3.1.3 Public Education and Promotion - Profile # 3

General Overview	The Solid Waste Authority (SWA), West Palm Beach, Florida, promotes solid waste diversion concepts through school curricula and "environmental shopping brochures". It distributes these brochures, including an "Environmental Shoppers List" of products that use recycled materials in their packaging, in free reusable canvas shopping bags.
Case Study / Subject Jurisdiction:	**"Environmental Shoppers List" - West Palm Beach, Florida**
Demographics	Community Type: Mixed urban and rural 37 cities and non-corporated areas Population: about 1,000,000
Political/ Social Factors	Information requested but not provided or available.
Driving Forces	State's goal of 30% waste diversion by 1994.
Detailed Description	Environmental Shoppers Lists are distributed by the SWA. These lists include products usually purchased in a grocery store which: - Have minimal packaging. - Are made of recyclable packaging. - Include recycled content. - Are environmentally benign. - These lists are stuffed in free reusable canvas shopping bags by volunteers or part-time employees. - Residents can call SWA office and request that the bag sent to them or pick it up at the office themselves.
Specific Features	The program started in 1991 and is an on-going service of the SWA.
Waste Types and Sources	Grocery products packaging waste.
Operational Responsibility	Operated by the Solid Waste Authority which is responsible for waste collection and disposal.
Public Education/ Promotion/ Training	- Newspaper ads. - Special events. - Presentation through local organizations.

Key Issues in Municipal/ Resident Acceptance
- Program is well known and accepted.
- No difficulty in recruiting volunteers.

Financing and Economics

Operating Costs
- Each bag costs about $CND 2.50 and educational material is about $CND 0.64 per bag, plus mailing costs.
- An average of 150 bags distributed monthly.

Administrative Costs
Administrative costs for this program are not separately identified.

Financing Arrangements/ Issues
- Program is one of a number funded through a state grant of approximately $CND 1,270,000.
- Less than $CND 12,000 is allocated to this initiative.

Performance

Waste Diversion Impact
Information requested but not provided or available.

Contacts

Governmental
Mark Eyeington
Director of Operations
Solid Waste Authority
7501 North Jog Street
West Palm Beach, Florida, 33412
(407) 640-4000

Research References

Literature Sources
Source Reduction Initiatives
Institute for Local Self-Reliance

Personal Communications
Sherry Weinsching
West Palm Beach
(407) 640-4000

3.0 PUBLIC EDUCATION AND COMMUNICATIONS

3.1 Approaches and Strategies for Citizens

3.1.4 Public Education and Promotion - Profile # 4

General Overview

For a three month period in 1990, a model program was implemented in all Boulder grocery stores which included posting of signs and distribution of brochures throughout the stores to encourage shoppers to bring their own bags, to buy in bulk and to make other environmentally sound purchasing choices.

Case Study / Subject Jurisdiction:

Precycle program in Boulder, Colorado

Demographics

Community Type: Urban
Population: 90,000

Political/ Social Factors

Information requested but not provided or available.

Driving Forces

- Eco-Cycle, a local non-profit organization, has been instrumental in developing and initiating various recycling, waste reduction and public educations programs in Boulder since the early 1980's.
- Program was designed not only to initiate precycling in Boulder, but also to serve as a model program for the Rocky Mountain Region.

Detailed Description

The program was designed as an in-store campaign focused on grocery stores because:

- Everyone in Boulder would come in contact with targeted materials on a regular basis.
- A point-of-purchase campaign offered the best opportunity for affecting consumer behaviour.

Goals of the pilot program included:

- Increase consumer awareness about ways to minimize waste when shopping.
- Reduce the quantity of waste material actually purchased.
- Measure the effectiveness of the campaign.
- Demonstrate the workability of a Precycle campaign and share this information with other interested communities.
- Provide information about how to develop a long-term precycle program.

Detailed Description (Cont'd)

- City Council has endorsed concept of precycling, and has given its support to an integrated waste management plan which would incorporate precycling.
- The proposed plan includes a waste diversion goal of 30% by 1995, with precycling accounting for 3% of that total.
- Based on this goal, a long-term precycle program is being phased in targeting audiences through in-store promotion (similar to the pilot project), a school education program and a media campaign.
- One of the stores most active in the pilot program has agreed to extend and expand in-store precycling as well as act as a "grocery store classroom".

Specific Features

- Pilot project conducted for a period of three months in 1990; one of the stores has agreed to continue the program.
- Pink shelf labels, based on predetermined labelling criteria, highlight products in packages which were recycled, are recyclable or involve minimal packaging.
- In-store signs display messages such as Buy in Bulk and Save, Did You Remember Your Shopping Bags?.
- Employees were provided with training and asked to wear pink precycle buttons which encouraged customers to "Ask me About Precycling" during the campaign.
- Information booths, staffed by volunteers for a portion of each week, offered:
  - Precycle brochures.
  - Information on related topics such as recycling and composting.
  - Information on a "low-waste product of the week".
  - Postcards to forward comments to manufacturers about products and packaging.
- Product tallies and consumer surveys were used to measure shifts in attitudes and purchasing patterns generated by the program.
- Computerized "60 second" surveys, at busy locations (e.g front of a grocery store), were designed to measure consumers' awareness of packaging waste issues before and after the precycle campaign.
- Volunteers were solicited through newspaper notices, letters to environmental groups and direct calls.
- Volunteers underwent a 2 hour training session and/or received a binder of information.
- 93 volunteers contributed approximately 375 hours during the three month project.
- 3 - 5 volunteers, plus a municipal staff person, spent 2 - 4 hours per store completing in-store labelling prior to program kickoff.

Waste Types and Sources

Food and household product packaging.

Operational Responsibility

Municipally operated with assistance of volunteers.

Contractual Arrangements

Information requested but not provided or available.

Role/ Requirements of Resident, Private/ Public Sectors

- Funded jointly by the Colorado Environmental Protection Agency, City of Boulder and County of Boulder.
- Initiated and managed by the City of Boulder.
- Delivered primarily using volunteers.
- Ultimate success of the program depends on the response and involvement of residents.

Public Education/ Promotion/ Training

- Store employees received training (staff meetings, bulletin boards, flyers stuffed in paychecks).
- Volunteers attended a 2 hour training session and/or were given a binder of information.
- Kick-off celebrations and information tables staffed by volunteers.
- Students tours were provided (in the future will be incorporated as part of regular recycling curriculum).
- Media coverage including newspaper, local radio and television.

Key Issues in Municipal/ Resident Acceptance

Information requested but not provided or available.

Applicability to North/South, Urban/Rural

Applicable to all communities for use in grocery stores or possibly other stores selling consumer items e.g. hardware stores.

Financing and Economics

Operating Costs

Budget (in $CND, year - 1990):	
City staff time (400 hrs)	$ 11,700 (in-kind)
Volunteer time (375 hrs)	3,350 (in-kind)
Work contracted out (600 hrs)	11,300
Graphic Design	4,800
Material Printing	
Brochure (20,000)	6,580
Shelf Labels	380
In-Store Posters	2,420
Postcards (1000)	220
Buttons (2500)	760
Computerized Surveys	1,330
Miscellaneous	
Information Easels	230
Supplies & Photos	1,530
Total	$ 44,600

Administrative Costs

Information requested but not provided or available.

Financing Arrangements/ Issues

- The pilot project was funded through grants of $CND 19,000 from the Colorado Environmental Protection Agency, matched by $CND 19,170 from the City of Boulder, with an additional grant of $CND 6,430 from Boulder County.
- The City's contribution included $CND 15,050 in-kind services (staff and volunteer time) and $CND 2,100 in donations solicited from grocery stores.

Performance

Waste Diversion Impact

Information requested but not provided or available.

Observed/ Measured Impact on 3R Awareness, Participation

- 84% of shoppers surveyed were familiar with program. 74% said it had helped them reduce waste.
- 54% of shoppers surveyed were able to identify precycle concepts on multiple-choice questionnaires correctly.
- 30% were able to identify precycle concepts without prompting.
- approximately 2000 shoppers spoke with a precycle volunteer.
- 12,000 brochures were distributed.
- In general, lower levels of program recognition were recorded at the large chain stores than at the smaller stores (several of which had a natural foods orientation).
- Of the 5 large chain stores, 4 had program recognition rates clustered around 41% while one, with particularly supportive management, was at 47%.
- The store with the highest program recognition level, 75%, was also the store where the program kickoff was held; this particularly high recognition level may have resulted from the employees strong sense of program ownership, developed from the use of their store for the program kickoff.
- Sales of cloth shopping bags rose by nearly 700% in participating stores (and by 40% in the one non participating store).

Labour Requirements

- City staff time - 400 hours (coordinating volunteers, weekly visits to each store to check labels, change the "product of the week" display, restock brochures, provide ongoing solicitation and pick up volunteer sign-ups).
- Volunteers - 375 hours (assisting with in-store labelling, staffing weekly information tables at each store, doing consumer surveys, etc).

Contacts

Governmental

City of Boulder, Colorado
Alison Peters
Director of Environmental Affairs
P.O. Box 791
Boulder, CO 80306
(303) 441-4207

Research References

Literature Sources

Source Reduction Initiatives
Institute for Local Self-Reliance

Final Report - Recycle Boulder - Precycling
City of Boulder Environmental Affairs

Personal Communications

Alison Peters
Director of Environmental Affairs
City of Boulder, Colorado

3.0 PUBLIC EDUCATION AND COMMUNICATIONS

3.1 Approaches and Strategies for Citizens

3.1.5 Public Education and Promotion - Profile # 5

General Overview

Providing the necessary information and support for individual action and 3Rs program participation is increasingly seen as key to an effective waste diversion program. Use of a network of trained volunteers to serve as contacts for recycling information for their neighbourhood has been found to be effective. The Eco-Cycle Block Leader Network, in Boulder, has been duplicated in many cities across the United States as a model for neighbourhood involvement in recycling education.

Case Study / Subject Jurisdiction:

Block Leader program in Boulder and Longmont, Colorado

Demographics

Community Type: Urban
Population: Boulder - 90,00
Longmont - 52,000

Political/ Social Factors

Information requested but not provided or available.

Driving Forces

The Boulder Block Leader program grew out of a promotional drive in 1979 initiated by citizens to encourage recycling in Boulder. Eco-Cycle, initiated in 1976, was providing monthly curbside pick-up of recyclables in Boulder. By 1979, financial difficulties threatened to end the program unless additional public funding was approved. Concerned volunteers launched a publicity campaign to measure public interest and lobby city officials. Neighbourhood surveys showed a high level of interest and support for recycling, even though city-wide participation in recycling was only 20% at that time. It was apparent that people were more receptive to personal contact than to the other forms of publicity about recycling. The Block Leader system was created out of this campaign in order to provide an ongoing link between the neighbourhoods and Eco-Cycle.

Though the work of a Volunteer Co-ordinator, by January, 1980, Boulder had 166 active Block Leaders, who reported 50-100% recycling participation in their neighbourhoods. On the basis of this expanded participation, the Boulder City Council awarded Eco-Cycle additional monies to continue and expand its programs. The program has continued to grow and in 1992 had over 900 Block Leaders, over 300 in Longmont and 600 in Boulder.

Detailed Description

Block Leaders are volunteers who assist recycling in their neighbourhood by:

- Distributing literature door-to-door about recycling.
- Talking with their neighbours.
- Giving recycling information to new residents.
- Generally being known as a contact for recycling.

Leaders are sometimes called upon to conduct surveys on recycling rates for their area, or to solve specific problems (e.g. helping elderly residents to take their recyclables to the curb). In areas with monthly collections, Eco-Cycle Block Leaders put out a yard sign once a month to advertise the pick-up day for their area.

An additional category of volunteer, the Region Leader, was created to help coordinate the network. A Region Leader serves as a co-ordinator for Eco-Cycle in their region comprised of a number of neighbourhoods or a specific area of town. The number of Block Leaders in each region can range from a few to up to 35. Region Leaders distribute literature to their Block Leaders and recruit new Block Leaders for their area.

Eco-Cycle is currently looking at expanding the role of Block Leaders to help promote other types of waste diversion programs, such as backyard composting and household hazardous waste education.

Specific Features

- Program started in 1979 and continues.

Each Block Leader receives a package containing information materials and education tools including:

- A welcome letter.
- 2 copies of a neighbourhood map; the block leader updates the map and returns one copy to the Volunteer Coordinator.
- Sufficient copies of an Introductory Letter and the Eco-cycle Fact Sheet for each household, plus extras for new neighbours.
- Block leaders are advised to use personal contact, if possible, when distributing the letter.
- A Block Leader Job Description and a Regional Leader Job Description.
- A copy of a "History of Neighbourhood Networks for Recycling" and "Eco-Cycle Community Presentations".
- Reminder notices to be distributed to each house the week prior to collection.
- Reminder stickers (one per household - these are applied to kitchen trash cans as a final reminder).
- One or two reminder signs, depending on neighbourhood size.
- Door-hangers, buttons.

Specific Features (Cont'd)	The Volunteer Coordinator, responsible for recruiting Region Leaders and co-ordinating the volunteer program, uses the following reference techniques:
	- Rolodex file for quick reference by name for all volunteers.
	- 5" x 8" index card filed alphabetically by region (all correspondence and phone calls from the block leader are recorded here).
	- Maps:
	  - Each region has a separate file folder.
	  - All corrections are recorded on the original neighbourhood map and a copy is sent to the region leader.
	
	The Eco-Cycle Volunteer Co-ordinator organizes orientation sessions, workshops and meetings for new and long-term Block Leaders. Volunteer recruitment is considered to be fairly easy using the following techniques:
	- Written letters to new residents.
	- Phone calls to Eco-Cycle (people call and ask if they can help).
	- Through existing volunteers (most successful).
	
	Currently Eco-Cycle is not concentrating on recruitment because it has been able to secure a long list of potential volunteers (a total of 1000 including the 900 active volunteers, with about 5 - 10 new listings per month).

Waste Types and Sources	Residential recyclables - newspaper, metal cans, glass.
Operational Responsibility	Operated by Eco-Cycle, a non-profit community recycling organization.
Contractual Arrangements	Information requested but not provided or available.
Role/ Requirements of Resident, Private/ Public Sectors	The success of the Boulder Block Leader program has depended on: - Funding from the public sector. - Innovation and creativity from a non-profit organization. - The commitment of residents serving as Region and Block Leaders for their community.
Public Education/ Promotion/ Training	See Specific Features.
Key Issues in Municipal/ Resident Acceptance	Information requested but not provided or available.
Applicability to North/South, Urban/Rural	A Block Leader program could be implemented in any type of community to further any or all 3Rs activities at the household or neighbourhood level.
Multi-Unit Applicability	The concept of Block Leaders could be used with a multi-unit building to facilitate information exchange and support 3Rs programs.

Financing and Economics

Operating Costs

The Eco-Cycle Block Leader program is one aspect of their overall program and is therefore part of their annual budget. Eco-Cycle generates income from contracting with the cities of Boulder and Longmont, the county and the school districts as well as from the sale of recyclables collected within these jurisdictions. Seventy-five per cent of the revenue from the sale of recyclables goes back into funding public education programs, with the Block Leader being one of their primary programs.

Annual costs to co-ordinate and operate the program vary depending on donations of time, services and materials. For example, in 1993 all Block Leaders will receive a handbook. The total cost of distributing 1,000 of these handbooks is in the range of $CND 6,400. In order to compile, print and distribute this handbook, donations were sought from local businesses.

Administrative Costs

A minimum of a one-half time employee per year.

Contractual Arrangements

Eco-Cycle contracts for their recycling services with the cities of Boulder and Longmont, the county and school districts.

Performance

Waste Diversion Impact

Information requested but not provided or available.

Observed/ Measured Impact on 3R Awareness, Participation

- In the early years of the program (1980) block leaders reported doubling participation rates in recycling for their neighbourhoods.
- Presently no measurements are made to assess the impact of the Block Leader program on participation.

Contacts

Non-Governmental

Eco-Cycle
Mary Ellen Cuthbertson
Community Relations Director
P.O. Box 19006
5030 Pearl Street
Boulder, CO 80308-9006
(303) 444-6634

Research References

Literature Sources

Materials supplied by Eco-Cycle

Personal Communications

Eco-Cycle
Mary Ellen Cuthbertson
Community Relations Director

3.0 PUBLIC EDUCATION AND COMMUNICATIONS

3.1 Approaches and Strategies for Citizens

3.1.6 Public Education and Promotion - Profile # 6

General Overview

Providing the necessary information and support for individual action and 3Rs program participation is increasingly seen as key to an effective waste diversion program. Use of a network of trained volunteers to serve as contacts for recycling information for their neighbourhood has been found to be effective. The Master Recycler/Composter program trains volunteers to educate friends, neighbours, co-workers about source reduction, recycling, home composting, and household hazardous waste management. The program was implemented in January 1990 and continues to operate.

Case Study / Subject Jurisdiction:

Master Recycler/Composter program in King County, Washington

Demographics

Community Type: Mixed urban and rural.
Population: 1×10^6

Figures exclude Seattle.

Political/ Social Factors

State of Washington Bill 1671, passed in 1989, made waste reduction and recycling top priorities.

Driving Forces

State's goal of 50% waste diversion by 1995 and 65% by the year 2000.

Detailed Description

- Master Recycler/Composter program is a community education program focusing on resource conservation and waste diversion.
- Participants receive 45 hours of training in recycling, source reduction, home composting, and household hazardous wastes.
- In return for training, Master Recycler/Composters (MRC's) share their knowledge and skills with others by volunteering at least 40 hours of public service.

Specific Features

- MRC program started in 1990 and continues.
- MRC training sessions are held three times each year - in the winter, spring and fall-participants meet weekly (25 - 30 people per session) over a period of two months for daytime or evening courses.
- Training involves classes, workshops, tours and field days.
- Periodic potluck dinners/meetings are scheduled to keep MRC's abreast of new developments and in touch with each other.

Specific Features (Cont'd)

Development and refining of outreach activities:
- In 1991, training activities were refined to provide more information on household hazardous waste and waste diversion and to better familiarize MRC's with outreach resources and recycling programs in King County communities. The following tools were designed:
  - A household hazardous waste outreach kit.
  - A plastics recycling outreach display.
  - The "Garbage Pie" display.
  - The "Guess What's Recyclable" display.
- Increased use of the MRC newsletter "Tales From the Waste-Less Land" to provide details on new programs and legislation.
- Training for conducting "Shop Smart" tours.
- Addition of a new half time Outreach Coordinator position (1991).
- Increased commitment of the Site Coordinators to assist with coordination of voluntary outreach activities at demonstration sites and nursery displays.
- Regional clusters of MRC volunteers performed regular site cleanup, weeding, watering and stocking of brochures at all Composting and Recycling Demonstration Sites, all Nursery Demonstrations, etc.

Waste Types and Sources

Residential recyclable, compostable and household hazardous waste.

Operational Responsibility

The King County Solid Waste Division oversees the continued development/implementation of the program through the use of a consultant, Washington State Energy Services.

Contractual Arrangements

Information requested but not provided or available.

Public Education/ Promotion/ Training

- Information booths in high profile locations and at community events.
- Recycling/composting hot line.
- Press releases.
- Reduction displays, games, MRC identification banner and display signs were developed to improve outreach efforts.
- Presentations for schools and during community fairs.
- MRC's outreach activities included (1991):
  - 10,272 public contacts.
  - 176 outreach events which included:
    - 34 booths and displays at community fairs and special events.
    - 18 workshops at nurseries.
    - 23 workshops and community group presentations.

Public Education/ Promotion/ Training (Cont'd)

    - 20 school presentations and tours.
    - 11 series of "Shop Smart" tours.
    - 6 in house recycling projects.
    - 13 educational projects in work settings or in the community.
    - Thousands of contacts at the Seattle Home Show, King County Fair and other large events.
    - Distributed over 40,000 King County waste reduction, composting and recycling brochures at nursery displays, composting and recycling demonstration sites and libraries.

Key Issues in Municipal/ Resident Acceptance

- Master Recycler/Composter program is well known and accepted.
- No difficulty in recruiting volunteers.
- Methods of promotion are very successful.

Applicability to North/South, Urban/Rural

Applicable to any type of community.

Multi-Unit Applicability

Program applicable to multi-unit, although specific information may differ.

Financing and Economics

Operating Costs

- Total program cost for the year 1993 is estimated to be in a range of $305,000 - $CND 320,000 (each training session costs about $CND 27,000).

Master Recycler\Composter Program - Project Budget (1992) in $CND:

Program development & training	$ 77,710
Program promotion & volunteer recruitment	26,225
MRC outreach & volunteer coordination	39,962
Demonstration sites & educational displays (includes $CND 22,250 of materials)	49,236
Site maintenance & management	6,277
Nursery composting demonstration program	6,180
Residential waste reduction education	24,475
Program evaluation & final report	13,974
Rent	7,175
Indirect costs (telephone, facsimile, copying, mail, public inf. staff, word processing staff and telephone reception staff)	48,363
Total	$CND 299,577

Administrative Costs

About 1/3 - 1/2 of one employee from recycling division in municipality is devoted to this program.

Financing Arrangements/ Issues

- 60% of the program is funded by the State.
- 40% is paid by local municipality from tipping fees.

Contractual Arrangements

Contract with a consulting company to conduct training of volunteers.

Performance

Waste Diversion Impact

Information requested but not provided or available.

Observed/ Measured Impact on 3R Awareness, Participation

Information requested but not provided or available.

Labour Requirements

1/3 - 1/2 of one municipal employee plus consultant and volunteers.

Contacts

Governmental

Lyne Davis
King County
Solid Waste Division
400 Yesler Way, Room 600
Seattle, WA 98104-2637
(206) 296-6542

Research References

Literature Sources

Publicity and Education - Residential
Institute for Local Self-Reliance

Materials supplied by the King County Solid Waste Division:
King County Master Recycler Composter Education Program, Final Report and Evaluation -1990 and 1991

Scope of work from the 1992 MRC contract between Washington State Energy Office and the King County Solid Waste Division

Personal Communications

Lyne Davis, King County

3.0 PUBLIC EDUCATION AND COMMUNICATIONS

3.2 Approaches and Strategies for Communities

3.2.1 Green Community - Profile # 1

General Overview

Providing the necessary information and support for individual action and 3Rs program participation is increasingly seen as key to an effective waste diversion program. The Green House program provides educational information on energy and water conservation, indoor air quality and solid waste diversion through public workshops and home audits.

Case Study / Subject Jurisdiction:

Green House program in St. Paul, Minnesota

Demographics

Community Type: Urban
Population: 272,000
Households Served: 300

Political/ Social Factors

Landfill diversion goal of 45% by 1996.

Driving Forces

This program is an extension of the energy conservation and recycling programs conducted by the Saint Paul Neighbourhood Energy Consortium (NEC).

Detailed Description

- Homeowners are invited to attend workshops in order to qualify for a home audit.
- Workshops have various main subjects: e.g. Reduce what is Thrown Away, Green and Clean (free safe cleaning kits are distributed), Conserve Energy - An Approach for the 90's. Participants are instructed on workshop topic, receive information about home audits and are encouraged to sign up for a home audit.

Specific Features

- Pilot program is in its second year of operation and is expected to be extended in the future. The program started in August 1992 with a pilot project involving 60 homes; Phase 2 of the project involves a total of 300 homes.
- A 2-3 hour home audit includes:
  - Helpful information about conserving water and energy, reducing solid waste (yard waste, HHW, etc.).
  - Free installation of water conservation devices for toilets, showers and faucets.
  - Testing of furnaces and microwave ovens for safety and efficiency.
  - Testing for carbon monoxide and radon.

Waste Types and Sources

Municipal solid waste and household hazardous waste.

Operational Responsibility	Saint Paul Neighbourhood Energy Consortium, a non-profit organization, operates the program.
Contractual Arrangements	Information requested but not provided or available.
Role/ Requirements of Resident, Private/ Public Sectors	- Non government organization designed, initiated and operates program. - Funding provided by the State Legislative Commission on Minnesota Resources. which draws from fund supplied by a variety of sources including lotteries, cigarette taxes and oil and gas surcharges. - Residents take part in workshop, request a home audit and implement suggested measures.
Public Education/ Promotion/ Training	- Flyers advertising workshops are distributed through bulk mail system. - NEC distributes, by mail, a recycling schedule and newsletter, Curbsider, which includes notification of the workshops (residents are asked to call in if they want to be on the mailing list to receive this newsletter).
Key Issues in Municipal/ Resident Acceptance	Information requested but not provided or available.
Applicability to North/South, Urban/Rural	Could be undertaken at neighbourhood level in all community types.
Multi-Unit Applicability	Could be tailored for multi-unit residential buildings and implemented in co-operation with property owner.

Financing and Economics

Operating Costs	A grant of $CND 203,000 was received for a 2 year project.
Administrative Costs	Information requested but not provided or available.
Financing Arrangements/ Issues	Funding for this 2 year project came from the Minnesota State Legislature as recommended by the Legislative Commission on Minnesota Resources.
Contractual Arrangements	Information requested but not provided or available.

Performance

Waste Diversion Impact	Information requested but not provided or available.
Observed/ Measured Impact on 3R Awareness, Participation	Information requested but not provided or available.
Labour Requirements	- Two full time employees (project manager plus home auditor). - Some clerical support provided through other NEC activities.
Labour Skills Required	Trained person to conduct home audits.

Contacts

Non-Governmental

Sally Patrick
Green House Project Manager
Saint Paul Neighbourhood Energy Consortium
475 North Cleveland Ave., #100
St. Paul, MN 55104
(612) 644-5436

Research References

Literature Sources

Brochures advertising workshops and the Green House program

Personal Communications

Sally Patrick
St. Paul Energy Consortium

3.0 PUBLIC EDUCATION AND COMMUNICATIONS

3.2 Approaches and Strategies for Communities

3.2.2 Green Community - Profile # 2

General Overview

Providing the necessary information and support for individual action and 3Rs program participation is increasingly seen as key to an effective waste reduction program. Use of a network of trained volunteers to serve as contacts for recycling information for their neighbourhood has been found to be effective. Worldwide Home Environmentalist's Network (W.H.E.N.) is a non-profit grassroots environmental society whose main goal is to provide educational materials and support to people who want to reduce waste and consumerism.

Case Study / Subject Jurisdiction:

Worldwide Home Environmentalist's Network (W.H.E.N.), West Vancouver, BC

Demographics

Information requested but not provided or available.

Political/ Social Factors

Information requested but not provided or available.

Driving Forces

Information requested but not provided or available.

Detailed Description

W.H.E.N. is a non-profit society whose purpose is to educate people through personal contact and thus empower them to bring about positive environmental changes. W.H.E.N.'s grass roots movement began as meetings of a handful of neighbours and friends to discuss and educate each other about recycling. The group soon realized that by making very simple choices, by supporting each other in pairs or small groups and by networking through their own communities and around the world, they would be able to encourage change.

W.H.E.N. organizes workshops, public information meetings (once a month), school and neighbourhood presentations and publishes two newsletters a year. The organization encourages its members (anyone can become a member) to take an active involvement in W.H.E.N.'s activities and provides members with a comprehensive information packet which gives details on current issues and ideas for personal action.

Specific Features	The following are the issues W.H.E.N. is currently addressing: - How to become a conserver. - Cautioning people that recycling still does consume energy and creates environmental impacts from transport and remanufacturing of materials. - Patronizing local small businesses (small is often more environmentally friendly) - organically grown food. - Encourages community composting and gardens at schools, parks, etc. - Support of mulching and bans on outdoor burning. - How to have toxic free homes. - Finding non-wasteful alternatives. - Advocates revival of cotton diapers. - Protection of trees. - Lobby for strict laws regarding drinking water quality. - Promotes vegetarianism. - Support of environmentally sound ways of communication and transportation. - Support for indigenous people who have traditionally been environmentally conscious and lived in a sustainable way. - W.H.E.N. members come from a number of countries including Australia and New Zealand.
Waste Types and Sources	- Residential waste including household hazardous waste. - IC&I waste.
Operational Responsibility	Volunteer efforts.
Public Education/ Promotion/ Training	- Public information meetings. - Presentations for schools and community groups. - Distribution of brochures (often published by other organizations). - Encourages people and organizations to feel free to copy and distribute their materials.
Key Issues in Municipal/ Resident Acceptance	Information requested but not provided or available.
Applicability to North/South, Urban/Rural	Applicable to any community type.

Financing and Economics

Operating Costs	Organization developed through volunteer efforts. No operating costs available.
Administrative Costs	Information requested but not provided or available.

Performance

Waste Diversion Impact	Information requested but not provided or available.

Observed/ Measured Impact on 3R Awareness, Participation Information requested but not provided or available.

Contacts

Non-Governmental

Sue Cameron
Director
Worldwide Home Environmentalist's Network
Box 91010
West Vancouver, BC V7V 3N3
(604) 926-5079

Research References

Literature Sources Materials supplied by W.H.E.N. (their newsletters, brochures)

Personal Communications

Lesley Henderson
Worldwide Home Environmentalist's Network
(604) 926-5079

3.0 PUBLIC EDUCATION AND COMMUNICATIONS

3.2 Approaches and Strategies for Communities

3.2.3 Green Community - Profile # 3

General Overview

Providing the necessary information and support for individual action and 3Rs program participation is increasingly seen as key to an effective waste diversion program. Use of a network of trained volunteers to serve as contacts for recycling information for their neighbourhood has been found to be effective. The Home Waste Survey Project developed and tested an in-home waste reduction technique in 100 households. Specially trained Waste Surveyors provided one to two hour, face-to-face workshops in the homes of volunteer households.

Case Study / Subject Jurisdiction:

The Home Waste Survey Project in the City of Moorhead, Minnesota, and the Phillips neighbourhood of Minneapolis, Minnesota.

Demographics

Community Type: See below
Households Served: 100

- Phillips - urban, ethnically mixed, low income.
- Moorhead - semi-rural, ethnically homogeneous, fairly prosperous.

Political/ Social Factors

Information requested but not provided or available.

Driving Forces

- Designed to create changes in behaviour leading to source reduction of wastes at the residential level.
- Problems with secondary materials markets suggest that recycling is not a panacea for waste problems.
- Literature indicates that individualized in-home programs are more effective in encouraging behavioral change than mass media campaigns.

Detailed Description

The Home Waste Survey involves sending trained Surveyors into residences to provide personalized workshops, concluding with specific suggested steps for action. The research data was gathered via survey from 100 households in the City of Moorhead (an ethnically-homogeneous and fairly prosperous semi-rural community), Minnesota, and 100 households in the Phillips neighbourhood of Minneapolis (an ethnically mixed, low-income area), Minnesota. In each community, 50 households participated in the Home Waste Survey conducted by Eco Solutions and 50 households which did not receive the Survey were used as a control group. Participating households volunteered to take part in this pilot project by signing-up.

Detailed Description (Cont'd)

The Waste Survey attempted to determine whether changes in behaviour that lead to source reduction were effected by variables such as:
- Gender of participants.
- Level of participation in recycling programs.
- Neighbourhood.
- Home ownership.

The Survey concentrated on:
- Source reduction of wastes, including hazardous wastes.
- Water and energy conservation.

The results of several data analyses were presented in the following manner:
- Comparison of the patterns of use of individual products:
  - Between the two neighbourhoods.
  - Between participants in the survey and households that did not participate.
- A summary index of the use of waste reducing products was developed and comparisons were made between the two neighbourhoods and between participants and non-participants.

Pilot phase of the project involved hiring and training Waste Surveyors, advertising the project in the target neighbourhoods, completing 100 Surveys, gathering information from 200 households on waste reduction product use, tabulating the resulting data, and publicizing the project's outcome.

Specific Features

- The Home Waste Survey Project was developed and tested in 1991.

The Survey, conducted by a trained person, lasted one to two hours, depending on resident's interest level, and included:
- Information on the Waste Survey process.
- A tour of the home, including determination of what waste is produced and how it is currently handled.
- Preliminary education on source reduction including financial and environmental benefits.
- An explanation of opportunities to:
  - Reduce waste generation.
  - Dispose of hazardous wastes properly.
  - Participate in recycling programs.
  - Implement home composting.
  - Participate in composting programs .
- Encouragement for the resident's existing efforts to reduce solid and hazardous waste generation.
- Specific steps for action that are appropriate to the resident's current interests and lifestyle.
- Written information about source reduction and a list of vendors of waste reducing products.

Specific Features (Cont'd)

The Waste Survey allowed space for up to six suggested steps for action (eg.: buy milk in refillable containers, use cloth napkins, buy concentrated detergents, etc). These were divided equally between First Steps for Action and Later Steps for Action. Measuring the action taken on these items was used to determine the impact of the Waste Survey process. Each household which participated in the Survey was re-contacted two to three weeks later with a series of follow-up questions, to collect data on Survey results and encourage further action.

At the time of the follow-up calls, the residents were asked for an update on each Step for Action. The form allowed three possible responses:

- "Done"
- "Not Done"
- "Started To Do"
- Follow-up revealed that 57% of the suggested steps were reported to have been done or started three weeks after the Survey performance.

	City of Moorhead	Phillips Neighbourhood	Total
Committed Steps for Action:	299	293	592
Done	86	43	129
Started	90	120	210
Not Done	123	130	253
Done or Started: Total	176 (59%)	163 (56%)	339 (57%)

Steps for Action suggested by residents as their preferred areas for action during Home Waste Surveys:

	City of Moorhead	Phillips Neighbourhood	Total
Paper Reduction:	68	58	126 (21%)
Improve Recycl./Close Loop:	59	53	112 (19%)
Packaging Reduction:	54	53	107 (18%)
Hazardous Materials Reduction:	37	48	85 (14%)
Energy Conservation:	41	31	72 (12%)
Water Conservation:	22	29	51 (9%)
Gardening or Composting:	10	10	20 (3%)
Multi-use Items Over Single-Use	7	10	17 (3%)
Transportation:	1	1	2 (<1%)

Specific Features (Cont'd)	Ten Most Common Suggestions - Phillips: - Move to low-toxicity cleaners (25). - Reduce Direct Mail (24). - Recycle all paper (23). - Toilet water conservation (20). - Use cloth over paper in kitchen (17). - Switch to compact fluorescent light bulbs (15). - Reuse containers/bags (10). - Purchase recycled paper products (10). - Use second sides of paper (8). - Replace single-use products with permanent products (8). Ten Most Common Suggestions - Moorhead: - Reduce Direct Mail (26). - Purchase food in bulk (25). - Purchase permanent coffee filter (21). - Recycle all cardboard and paper (21). - Purchase recycled paper products (18). - Toilet water conservation (17). - Low-toxicity, concentrated detergent in recyclable container (16). - Purchase in larger, recyclable containers (9). - Seal windows (8). - Minimize aerosols (8).
Waste Types and Sources	Residential waste including household hazardous waste.
Operational Responsibility	Municipality.
Contractual Arrangements	Contracted to Eco Solution (a non-profit organization).
Role/ Requirements of Resident, Private/ Public Sectors	- Public sector provided funding. - Non government organization conducted survey, educated residents and provided survey follow up. - Residents volunteered to participate and undertake suggested actions.
Public Education/ Promotion/ Training	- The Waste Survey proved to be a useful residential waste education tool. - Written information about source reduction and list of vendors of waste reducing products. - Mass media advertising.

Key Issues in Municipal/ Resident Acceptance

- Convenience to resident (surveyor visiting the home).
- Action plan was geared to individual resident's need and level of interest.
- Results indicate that the Waste Survey is an effective technique, despite differences in the two neighbourhoods.
- No statistical relationship between recycling activity and source reduction behaviour was found.
- Research results did not identify a correlation between source reduction actions and any of the possible variables. However, more research is needed in this area, especially in closer tracking of historical factors, measurement of additional demographic variables, and long-term follow-up for participating households.
- According to this and earlier research, the public does not differentiate recycling from source reduction. This indicates a need to more carefully distinguish between recycling and reduction when designing waste policies and to study and promote source reduction through avenues that are clearly separated from recycling activities.

Applicability to North/South, Urban/Rural

The Home Waste Survey can be implemented by local governments and citizens' groups in any community type.

Multi-Unit Applicability

Highly applicable to multi-unit buildings.

Implications for Other Aspects of Waste Management System

The Project Budget (October, 1991) and actual Expenditures are listed below. Differences are due to:

- Higher advertising, graphics and administrative costs than anticipated were required to recruit participant households.
- Lower than anticipated insurance costs.
- Final results were publicized by mass media rather than direct mail which reduced printing costs and increased marketing and administrative costs.

Final Project Budget

Expenditure Category	Project Budget	Expenditures
Consultant:		
Admin./Research/ Writing	$CND 2,800	$CND 5,075
Marketing	3,800	4,068
Surveyors	8,300	8,572
Bookkeeping	500	318
Graphics	250	500
Telephone	670	1,150
Insurance	640	230
Supplies	250	477
Travel	1,270	1,740
Printing	6,760	3,190
Advertising/Promotion	250	560
Total	$CND 25,490	$CND 25,880

Financing and Economics

Administrative Costs	Information requested but not provided or available.

Financing Arrangements/ Issues	- Program was funded by the U.S. Environmental Protection Agency and other contributors such as:
	  - State of Minnesota Office of Waste Management.
	  - Dayton Hudson Foundation.
	  - Mardag Foundation.
	  - Ready Fund of The Tides Foundation.
	  - Unity Avenue Foundation.

Contractual Arrangements	Information requested but not provided or available.

Performance

Waste Diversion Impact	Recommendations for future Home Waste Surveys determined that best results could be obtained through: - Use of a pre- and post-test on source reduction interest, knowledge and behaviour at Survey and control residences. - Simplifying the Survey's forms. - Use of a carefully selected non-Survey control group. - Closer tracking of non-Survey historical factors. - Collection of more specific information on participating households. - More standardization of Surveyor training and performance. - Short term (3 week) and long term (6 week) follow-up Surveys.
Observed/ Measured Impact on 3R Awareness, Participation	- 5% participated in suggested waste diversion activities following initial visit by surveyor.
Labour Requirements	Information requested but not provided or available.

Contacts

Governmental	Minnesota Office of Waste Management 1350 Energy Lane, Suite 201 St. Paul, MN 55108 Bill Dunn (612) 649-5793

Research References

Literature Sources	Policy is Made at Home: The Home Waste Survey The Home Waste Survey - Draft Final Report Lilias Jones, Eco Solutions Inc. In-home education: a viable waste reduction tool Resource Recycling, January 1993
Personal Communications	Minnesota Office of Waste Management Bill Dunn

Section 4

Source Reduction

4.0 SOURCE REDUCTION

4.1 Residential Source Reduction

4.1.1 Residential Source Reduction - Profile # 1

General Overview

Collection, handling and composting or disposing of grass clippings represents a source of odour problems as well as contributing to the cost of operating these programs. Reducing or composting grass clippings at the source is seen as a more cost effective option which eliminates the associated odour problems. Between April and October, residential solid waste in Greenfield increases 20 - 50% because of grass clippings. The "Don't Bag It " Lawn Care Plan was implemented to reduce the amount of yard waste, in this case grass clippings, being sent to the city's landfill. It is estimated that the campaign prevented about 90 tonnes of grass clippings from being collected and landfilled.

Case Study / Subject Jurisdiction:

"Don't Bag It Lawn Care Plan" - Greenfield, Wisconsin (Greenfield is a suburb of Milwaukee)

Demographics

Community Type:	Urban	Households:	8,300
Population:	36,000	Households Served:	1,350

Political/ Social Factors

Information requested but not provided or available.

Driving Forces

The need to reduce amount of waste being landfilled encouraged city staff to get involved in "Don't Bag It Lawn Care Plan".

Detailed Description

In 1991, the residents of the City of Greenfield bagged approximately 567 tonnes (68 kg/household) of grass clippings for disposal in landfill at a tip fee of $CND 33 per tonne, or $CND 20,625.

In 1992, 1,350 homeowners pledged to not bag their grass clippings as part of Greenfield's Don't Bag It Program. Assuming each of the homeowners lived up to their pledge, they effectively saved the City $CND 3,500 on their waste hauling contract during the 1992 grass growing season. These savings were used to add a separate yard waste collection and composting program, operated by the contracted hauler, for Greenfield residents.

Specific Features

- Program was conducted in the summer of 1992.
- 52 participating households were given a Toro mulching lawn mower for the duration of the pilot (46 of them decided to purchase a Toro mower).
- Participants could win Toro mowers and fertilizer.
- Information meetings for participating residents held by the City.

Waste Types and Sources	Grass clippings.
Operational Responsibility	Operated by the local hauler (BFI) with support from the City, lawn mower and fertilizer suppliers.
Contractual Arrangements	Information requested but not provided or available.
Role/ Requirements of Resident, Private/ Public Sectors	- Initiated by the public sector. - Implemented with the co-operation of the private sector waste hauler. - Residents must participate by pledging to leave grass clippings on their lawns.
Public Education/ Promotion/ Training	- Brochures distributed through a direct mail campaign. - Information provided on general lawncare as well as the benefits of grass cycling. - Lawn mowers and fertilizers as prizes for participants in the program. - A survey of participants to determine their acceptance and reaction to the program.
Key Issues in Municipal/ Resident Acceptance	Information requested but not provided or available.
Applicability to North/South, Urban/Rural	Applicable to all communities where grass is collected as part of municipal solid waste.

Financing and Economics

Operating Costs	Information requested but not provided or available.
Administrative Costs	- The City of Greenfield provided administration for the campaign. - Approximately 5-10 person hours per week for 2 month period to work on the project.

Financing Arrangements/ Issues	- Don't Bag It campaign resulted from the combined efforts of:
	  - The City of Greenfield.
	  - BFI.
	  - The local hauler, R.L. Ryerson Company Inc.
	  - The Toro lawn mower supplier.
	  - Howard Johnson, a fertilizer supplier.
	- The program was funded by all parties, in part by donations of goods and labour.

Performance

Waste Diversion Impact

- Diverted an estimated 90 tonnes of grass clippings from landfill.
- City reduced hauling costs by 17%.
- Savings were used to implement collection and composting of yard waste.
- It is anticipated that the implementation of a high profile grass cycling campaign would reduce potential odour impacts from handling grass at yard waste site.

Observed/ Measured Impact on 3R Awareness, Participation

98% of participants believe leaving their clippings on the lawn did not decrease the quality of their lawn, and in many cases actually improved it.

Contacts

Governmental

Keven Klopp
Recycling Coordinator
The City of Greenfield
7325 West Forest Home Ave.
Greenfield, Wisconsin
(414) 543-5500, ext.313

Research References

Literature Sources

"Don't Bag" Campaign Clips 91 tonnes from grass collection
BioCycle, March 1993
Materials supplied by the City of Greenfield

Personal Communications

Keven Klopp
The City of Greenfield

4.0 SOURCE REDUCTION

4.1 Residential Source Reduction

4.1.2 Residential Source Reduction - Profile # 2

General Overview

Providing the necessary information and support for individual action and 3Rs program participation is increasingly seen as key to an effective waste diversion program. The Berlin Model for waste reduction was conducted with 50 volunteer families. Quantities and percentages of waste materials collected were measured prior to and then after an educational program. Participants were educated about the problems of managing residential wastes by trained consultants. After this training, participants source separated six different categories of materials, weighed each category and maintained detailed records.

Case Study / Subject Jurisdiction:

Berlin Model for Source Reduction, Berlin (West Berlin), Germany.

Demographics

Community Type: Urban Households Served: 50
Population: 1.7×10^6

Political/ Social Factors

Information requested but not provided or available.

Driving Forces

Information requested but not provided or available.

Detailed Description

Specific Features

- Households volunteered to participate.
- Baseline waste quantities were determined at program outset.
- Full educational program provided by trained personnel.
- Program monitored 6 waste categories.
- Participants kept log of their own waste quantities.

Waste Types and Sources

Residential household wastes.

Operational Responsibility

Initiated by the City of Berlin.

Contractual Arrangements

Information requested but not provided or available.

Role/ Requirements of Resident, Private/ Public Sectors

- Public sector provided funding and administration.
- Public sector contracted with consultants for public education .
- Residents required to separate and weigh categories of waste and maintain records.

Public Education/ Promotion/ Training	Education of participants included instruction on: - The practical aspects of waste separation and weighing, and record keeping. - Problems of waste management. - Opportunities for reduction.
Key Issues in Municipal/ Resident Acceptance	Information requested but not provided or available.
Applicability to North/South, Urban/Rural	This approach can be applied to any community type.
Multi-Unit Applicability	This approach can be applied to any building type.
Implications for Other Aspects of Waste Management System	During this project, the highest source reduction rates (33%) were achieved in the paper category with glass and metal also achieving reasonably high source reduction rates. Although backyard composting plays an important role, the biggest potential for reduction lay in the sum of the other waste fractions. Reduction of plastic and blister packaging proved difficult due to the lack of alternatives on certain products.

Financing and Economics

Operating Costs	Information requested but not provided or available.
Administrative Costs	Information requested but not provided or available.

Performance

Waste Diversion Impact	- 15 - 20% waste reduction was achieved. The quantity of household waste was effected by the educational program: - Prior to the educational program, each household produced 4.47 kg per day on average. - During the training phase, waste quantities dropped by 20%. - After training was completed, quantities rose again by 15-16%. - With a renewed educational program, it was reduced by 30%.
Observed/ Measured Impact on 3R Awareness, Participation	3Rs awareness and participation increased.
Labour Skills Required	Trained staff and/or consultants to implement public education program.

Contacts

Governmental

Mr. Zandonella
Senat fur Stadtentwicklung und Umweltschultz
(030) 829-8333

Research References

Literature Sources

I. Basche, ITEN Institut Heidelberg
Handbuch fuer die Abfallberatung, 1991
Chapter 4. page 31 - 65
Beispiele realisierter Abfallvermeidungsprojekte
MIC Baeze Verlag, Witzenhausen

4.0 SOURCE REDUCTION

4.1 Residential Source Reduction

4.1.3 Residential Source Reduction - Profile # 3

General Overview

Providing the necessary information and support for individual action and 3Rs program participation is increasingly seen as key to an effective waste diversion program. The City of Cologne, Germany initiated a two year study (1986 - 88) to determine the potential for waste diversion, with a focus on source reduction. Study participants included residents, municipal offices and members of the IC&I sector, while data was provided only for residential sector.

Case Study / Subject Jurisdiction:

Source reduction study - Cologne, Germany.

Demographics

Community Type: Urban
Population: 992,000

Political/ Social Factors

- Longerich is a mature suburban area of Cologne with relatively large gardens.
- Vingst - a community in Cologne, is an area of low income and immigrant workers.

Driving Forces

Information requested but not provided or available.

Detailed Description

Specific Features

- The program started with a two year study in 1986 - 1988 and has continued since then.

Education was the main tool to promote the source reduction initiatives:
- Information offices.
- Information booths at markets, street dances.
- Information distributed to schools, associations. etc.
- Telephone hotline.
- Door to door contact.
- Special information events.

Waste Types and Sources

Residential waste.

Operational Responsibility

Implemented by the municipality.

Role/ Requirements of Resident, Private/ Public Sectors

Public sector provides adequate information and promotional material.

Public Education/ Promotion/ Training	- Information booths were particularly successful. - Public education at schools was successful. - Good communication was established through letters to churches and community organizations. - Offices received only 50 calls per month.
Key Issues in Municipal/ Resident Acceptance	Intensive public education and outreach program.
Applicability to North/South, Urban/Rural	Applicable to any community type.
Multi-Unit Applicability	Applicable to any building type.

Financing and Economics

Operating Costs	- Total project operating and administrative costs were $CND 800,000 which included consulting fees, public education programs and office space. - Since 1989 (after this two year study) operating costs for continuation of this initiative are in the area of $CND 640,000.
Administrative Costs	Information requested but not provided or available.

Performance

Waste Diversion Impact	A waste analysis in one area of Cologne (Longerich) indicated: - A 6% reduction attributed to source reduction. - A 11% increase in source separated materials. - Further diversion may be achieved be addressing the 46.5% of the waste stream which is compostable. In Vingst there was an increased amount of source separated materials but a reduction of total waste was not measured.
Observed/ Measured Impact on 3R Awareness, Participation	Information requested but not provided or available.
Labour Skills Required	3Rs training and communication skills.

Contacts

Governmental	Mr. Polke The City of Cologne (221) 221 7301

Research References

Literature Sources

I. Basche, ITEN Institut Heidelberg
Handbuch fuer die Abfallberatung, 1991
Chapter 4. page 31 - 65
Beispiele realisierter Abfallvermeidungsprojekte
MIC Baeze Verlag, Witzenhausen

4.0 SOURCE REDUCTION

4.1 Residential Source Reduction

4.1.4 Residential Source Reduction - Profile # 4

General Overview

Providing the necessary information and support for individual action and 3Rs program participation is increasingly seen as key to an effective waste diversion program. A one year study from October 1986 to November 1987 was undertaken in Hamburg, Germany to determine to what extent residents who are participating in a source separated collection program can be motivated to further reduce waste. Reduction initiatives were measured by analyzing the quality and quantity of recyclables, HHW and waste.

Case Study / Subject Jurisdiction:

Source reduction study - Hamburg, Germany.

Demographics

Community Type: Urban Households Served: 81
Population: 1.7×10^6

Political/ Social Factors

Information requested but not provided or available.

Driving Forces

Motivations for the project were: - increasing landfill costs, declining landfill capacity, increasing garbage taxes, as well as the introduction of various legislation (such as the obligation of waste producers to reduce, reuse and recycle; penalty for those who dispose waste illegally, and bans on disposal of reusable/recyclable materials at municipal landfills and incinerators).

Detailed Description

Specific Features

- The program was conducted from October 1986 to November 1987.

Participants were selected using a questionnaire which established a background profile so that each of the following housing types were equally represented:
- Single family housing.
- Townhouse complexes.
- Walk up multi unit residential.
- High rise multi unit residential.

Specific Features (Cont'd)

Each participating household received:
- Direct information on possible reduction measures, backyard composting and alternative purchase options.
- 6 waste audits throughout the study period.

Waste Types and Sources	Residential wastes.
Operational Responsibility	Municipally operated as part of the German residential waste analysis program.
Contractual Arrangements	Information requested but not provided or available.
Role/ Requirements of Resident, Private/ Public Sectors	Each participating household was required to source separate: - Specified recyclables. - HHW. - Organic wastes. - Other wastes. The public sector established an information program to assist participants and provided collection and weighing of separated materials.
Public Education/ Promotion/ Training	Direct one on one personal training for each participating household carried out by the municipal recycling coordinator.
Key Issues in Municipal/ Resident Acceptance	Intensive information.
Applicability to North/South, Urban/Rural	Responses from each of the four housing types selected for participation in the study indicated that this approach is suitable for all community types.
Multi-Unit Applicability	Participation by multi unit households indicated acceptance by this group of participants.
Implications for Other Aspects of Waste Management System	An 8% reduction of waste by weight can be achieved assuming 30% of all households participate in the program.

Financing and Economics

Operating Costs	Information requested but not provided or available.
Administrative Costs	Information requested but not provided or available.
Contractual Arrangements	Information requested but not provided or available.

Performance

Waste Diversion Impact

Reduction by weight achieved during the study period with optimal information and support:

Paper/OCC	28%
Glass	20%
Metals	31%
Plastics	29%
Compostables	34%
Other	13%
Total	28%

Observed/ Measured Impact on 3R Awareness, Participation

Information requested but not provided or available.

Labour Requirements

Trained staff or consultants to provide continuous information and support.

Labour Skills Required

3Rs training skills.

Contacts

Governmental

Mr. Ganschow
(040) 7717-2576
Mr. Schroder
(040) 7717-0470
Stadtreinigung Hamburg

Research References

Literature Sources

I. Basche, ITEN Institut Heidelberg
Handbuch fuer die Abfallberatung, 1991
Chapter 4. page 31 - 65
Beispiele realisierter Abfallvermeidungsprojekte
MIC Baeze Verlag, Witzenhausen

4.0 SOURCE REDUCTION

4.2 IC&I Source Reduction

4.2.1 IC&I Source Reduction - Profile # 1

General Overview

Hudson's department stores use packing material as protection when shipping items to customers and returning merchandise to vendor. Before 1990, many Hudson's stores in Michigan used polystyrene "peanuts" for packing. All Michigan stores replaced this packing material with paper early in 1990. The purchased paper packing material performed well and was popular with employees but was considered expensive. In 1987, the Briarwood Mall store in Ann Arbor experimented with shredding its own office paper waste for packing. As a result of experience gained in the Briarwood shredding program and the high costs of purchased paper material, Michigan Hudson's stores recently replaced purchased paper packing with shredded office paper waste generated from internal operations.

Case Study / Subject Jurisdiction:

Hudson's department stores, Dayton-Hudson Corporation, Michigan.

Demographics

Information requested but not provided or available.

Political/ Social Factors

Consumer concern about environmental issues, specifically waste.

Driving Forces

Economic.

Detailed Description

In 1987, the Hudson's store in Ann Arbor experimented with shredding its own office paper waste for packing purposes. Word of this successful operation spread among operations managers of stores during management meetings and, after some review, they agreed collectively to pursue in-house production of shredded paper as packing material. The 19 tonnes of waste paper discarded annually from all 17 Michigan stores justified the purchase of a large, durable shredder.

Shredding has dramatically lowered packing costs, by approximately 43%, and has saved Hudson's stores in Michigan approximately $CND 22,000 each year for purchase of packaging materials. Before converting to shredded packing paper generated from its own operations, the 17 Hudson's stores in Michigan purchased approximately 15,000 kg of paper packing annually. Paper packing use, after conversion to internally shredded paper, is projected to remain the same, after adjustment for sales, with any excess shredded paper available for sale to other retailers.

Detailed Description (Cont'd)

Prompted by Hudson's Environmental Action Committee's ideas and the company's Environmental Action Policy, Hudson's department stores have implemented the following source reduction strategies:

- Reusable dishware has replaced disposable dishware for meetings and employee gatherings at many stores.
- Some stores have purchased ceramic mugs for office employees.
- Vendors are urged to reduce the amount of packing and packaging in their shipments.
- Rechargeable batteries have replaced disposable at some stores.
- Offices avoid using heavy-weight paper and reports are copied on both sides to further reduce paper use.

The corporate environmental policy, implemented on June 15, 1990, sets the following guidelines for Central Headquarters operations and individual stores:

- Reduce consumption of materials and energy and encourage vendors to do the same
- Implement recycling programs.
- Use recycled or recyclable material and encourage vendors to follow to do the same.
- Set up Environmental Action Committees at each store to increase employee awareness of environmental issues and solicit their participation in projects resulting. from company's environmental policy.
- Initiate a review process to assess and improve environmental practices.

Hudson's stores recycle office paper, OCC, mixed paper and beverage containers. The company also helps to stimulate markets for recycling products by purchasing items with recycled content.

Specific Features

- Program on-going but monitored during 1989.
- Central shredding operation for Michigan stores started in fall of 1990 at the Southland Mall store in Taylor.
- Paper suitable for shredding is collected in each office and placed in original delivery boxes.
- Staff at each store gather paper when the boxes are full and place material for shredding on the same carts used for general waste collection.
- Paper is collected from all stores, shredded, and is then sent to a central warehouse in Warren where it is redistributed to individual stores.

Waste Types and Sources

Program replaces polystyrene peanuts and purchased packing paper with shredded paper which was formerly discarded.

Operational Responsibility

- Program implemented and operated by Hudson's stores throughout State of Michigan.
- Monitoring project designed and managed by University of Michigan, Solid Waste Research Group, School of Natural Resources.

Contractual Arrangements

Information requested but not provided or available.

Applicability to North/South, Urban/Rural

- The successful waste reduction activities that have been introduced at Hudson's department stores can easily be duplicated by other retailers, particularly those owning a chain of stores.
- Recommendations for department stores, general retailers and other businesses interested in waste diversion:
  - Begin with a single program; confidence and experience gained with one program can be used in implementing others.
  - Perform process and cost analysis of proposed waste reduction strategies at your company to assess their feasibility.
  - An organization that encourages participation at all levels will be more successful in realizing waste reduction.
  - Many waste reduction strategies can be implemented without lengthy study
  - Retailers should inform customers of their efforts.
  - Advantages of reusable packing material made from office paper waste and any in-store reuse or recycling should be emphasized in advertising, informative inserts, and displays.

Financing and Economics

Operating Costs

Monthly Costs for Packing Materials for Michigan Hudson's stores in $CND:

	Before	**After**
Purchased Packing Costs:	4,250	0
Equipment & Supplies Amortized Costs:	0	230
Labour Costs:	0	2,100
Utility costs:	30	35
Total Costs:	4,280	2,365
Total Savings:	**$CND 1,915/month**	

Costs in the purchased packing case are confined to packing material and disposal costs for the office paper waste now collected for shredding. Disposal costs for the plastic packing ("peanuts") used for purchased packing are not calculated. In addition, no estimate of the cost of extra plastic trash bags used for waste collection in the before case is provided. Fewer bags are now needed because paper is separated and collected in corrugated boxes that are subsequently recycled.

Administrative Costs

Information requested but not provided or available.

Revenues

In-house production of packing material from paper discards saved Hudson's stores approximately $CND 22,000 each year on the cost of packaging materials. In an effort to generate additional revenue, Hudson's intends to shred approximately 27% more office paper than is needed internally. The excess, if sold at a price equivalent to what was previously paid for shredded packing material could generate as much as $CND 13,900 per year.

Financing Arrangements/ Issues

Monitoring project funded by a 1989-1990 Solid Waste Alternatives Program Grant under the Waste Reduction Research and Demonstration category - Michigan Department of Natural Resources.

Performance

Waste Diversion Impact

- By shredding used office paper for packing, the 17 Hudson's stores in Michigan divert 19 tonnes or about 20% of their total office paper waste every year.
- Assuming all department stores in Michigan are now discarding at least 20% of their recoverable office paper waste, adoption of the Hudson's shredding program throughout the sector could divert as much as 159 tonnes of material from state's landfills annually.

Observed/ Measured Impact on 3R Awareness, Participation

- The development of an organizational structure that provides formal avenues for implementing waste diversion plans made a major contribution to the success of Hudson's program.
- Employee participation at all levels produced a greater commitment to waste diversion.

Labour Requirements

- One employee was hired at the Southland store to operate the shredder and bag packing material.
- The operator spends approximately 5 hours per week on other tasks, and the cost of shredding labour was adjusted accordingly.
- 3.5 extra hours per month are required at each store to collect office paper and deposit in containers for shipment to the Distribution Centre.

Contacts

Governmental

Office of Waste Reduction Services
Departments of Commerce and Natural Resources
P.O. Box 30004
Lansing, Michigan 48909
(517) 335-1178

Research References

Literature Sources

Case Study - Hudson's department stores in Michigan
Office of Waste Reduction Services, State of Michigan

4.0 SOURCE REDUCTION

4.2 IC&I Source Reduction

4.2.2 IC&I Source Reduction - Profile # 2

General Overview

Staff at McPherson Hospital have implemented a series of waste reduction efforts. They realize that every kilogram of waste not produced saves already overburdened landfill space. In response to community and employee interest in waste reduction, Servicemaster Inc., McPherson's food service provider, has helped divert over 300 kilograms of waste each month, by converting from disposable dishware to durable, washable dishware.

Case Study / Subject Jurisdiction:

Converting from disposable to washable dishware at McPherson Hospital in Howell, Michigan.

Demographics

Information requested but not provided or available.

Political/ Social Factors

Diminishing landfill space in Livingston County has spurred interest in waste diversion. In 1987, the county's only operating landfill closed (due to leachate problems), and waste is now transported outside the county for disposal. The resulting search for landfill sites has increased community consciousness and is prompting residents and businesses to examine their waste disposal habits.

Driving Forces

Economic.

Detailed Description

Specific Features

- Program on-going but monitored during 1989.

McPherson is a typically sized Michigan hospital with 136 beds and 420 full time equivalent employees. Food for patients is provided by Servicemaster, Inc., which also runs a cafeteria for hospital employees and visitors. The cafeteria serves approximately 3100 meals per week with an additional 900 meals per week served to patients. Before the introduction of washable dishware, all meals in cafeteria were served on disposable dishware, primarily expanded polystyrene. Patients received ceramic plates. All other dishware for patient meals was disposable. The kitchen at McPherson Hospital was equipped with rinsing equipment and a dishwasher that handled trays, cutlery, and ceramic plates from patients before conversion to the current system. No new equipment was required for processing reusable dishes.

Specific Features (Cont'd)

Substituting reusable for disposable dishware resulted in two major changes in the dishware use process at McPherson:
- Total waste disposal from dishware uses fell dramatically.
- Labour inputs increased substantially.

When disposable dishes were used, fifty bags of trash were discarded from the kitchen daily. After the conversion to reusable dishes the kitchen discarded only two bags.

Number of other source reduction\measures were implemented by the hospital:
- Cloth diapers are used rather than disposables.
- Volunteers repair and refurbish a number of linen and bedding items that were previously discarded.
- Double sided photocopies are used for office documents.

Glass, steel and aluminum containers are recycled as well as office paper and newspaper.

Waste Types and Sources

Disposable dishware substituted by durable, washable dishware.

Operational Responsibility

- Program implemented and operated by McPherson Hospital
- Monitoring project designed and managed by University of Michigan, Solid Waste Research Group, School of Natural Resources.

Contractual Arrangements

Information requested but not provided or available.

Applicability to North/South, Urban/Rural

Dishwashing and rinsing capacity may affect transferability of the program to other hospital food service providers.

Factors enhancing transferability:
- Process changes required to replace disposable dishware with reusable dishes are minor, particularly when dishwashing equipment already exists.
- Significant waste reduction can be achieved by using washable rather than disposable dishware.
- Motivation for waste diversion is high in many communities and institutions.

Impediments to transferability:
- Hospitals without dishwashers may find the process of converting from disposable to washable dishware more complicated than the McPherson case.
- Costs of implementing a reusable dishware program may be viewed as too high in hospitals with no dishwasher or limited kitchen space.

Applicability to North/South, Urban/Rural (Cont'd)

- Substantial motivation may be missing in communities that do not feel pressured by landfill problems.
- Large organizations may find it more difficult to implement the full range of waste diversion programs practiced at McPherson. Differences in scale may require organizational efforts more complicated than those needed at McPherson.

Financing and Economics

Operating Costs

Converting from disposable to reusable dishware did not significantly change food service costs at McPherson hospital. Savings were realized in some categories, but costs increased in others.

Total Costs of Dishware Use per 1,000 Meals in $CND

Item Measured	Disposables	Reusables	Difference
Dishware			
Dishware & Supplies	203.00	76.00	127.00
Cost of Dishware Alone	169.00	1.53	167.47
Cleaning Chemicals Cost	1.28	22.89	(21.61)
Total Dishware Cost	204.28	98.89	105.39
Equipment			
Equip. Maint. & Repair	0.45	2.94	(2.49)
Dishwasher Racks	0.00	9.54	(9.54)
Refuse Collection & Disp.	4.95	0.00	4.95
Total Equipment Cost	5.40	12.48	(7.08)
Utilities			
Waste/Sewer Cost	1.30	5.47	(4.17)
Steam Cost	1.46	8.74	(7.28)
Electricity Cost	0.23	3.83	(3.60)
Total Utilities Cost	2.99	18.04	(15.05)
Labour			
Total Labour Cost	105.70	208.20	(102.50)
Total Cost per 1,000 Meals	318.44	337.61	(19.17)
Total Costs/Yr	$CND66,235.52	$CND70,235.36	($CND 3,987.36)

Labour costs nearly double when ceramic dishes are used.
Dishware and supplies cost half as much when ceramic dishes are used.

Operating Costs (Cont'd)

Further analysis reveals that overall costs in the disposable case are actually more sensitive to changes in the price of dishware than to changes in disposal fees. 64% of total costs are allocated for dishware and related supplies; disposal fees account for only 1.6% of total costs. In the short run, increases in the cost of disposable dishware can thus be expected to have a much greater impact on the economics of disposable dishware use than increases in disposal fees.

Changes in labour costs would have the greatest impact on the cost of using washable dishes. However, labour also constitutes 33.2% of total disposable dishware use costs, so any increase in labour costs would also affect the disposable case.

Administrative Costs

Information requested but not provided or available.

Financing Arrangements/ Issues

Monitoring project funded by a 1989-1990 Solid Waste Alternatives Program Grant under the Waste Reduction Research and Demonstration category - Michigan Department of Natural Resources.

Performance

Waste Diversion Impact

Waste Production per 1,000 Meals

Item Measured	Disposables	Reusables	Difference
Dishware Disposal Weight	15.2 kg	0.1 kg	15.1 kg
Packaging Weight	4.3 kg	0.0 kg	4.3 kg
Total Disposal Weight	19.5 kg	0.1 kg	19.4 kg

McPherson Hospital reduced waste production by 19.4 kg per 1,000 meals after converting to washable dishes in its food service operation. Ceramic dishes are much heavier than polystyrene equivalents, but only 5% of total inventory breaks each year, adding 0.1 kg to the kitchen waste stream for every 1,000 meals served.
McPherson Hospital reduced its waste by 4 tonnes per year after converting to reusable dishes.

Conversion from disposable to washable dishware by all 196 hospitals in Michigan could reduce annual solid waste production by as much as 800 tonnes.

Labour Requirements

Labour requirements increased nearly 80% after McPherson converted to washable dishes.

Labour Required per 1,000 Meals

Item Measured	Disposables	Reusables	Difference
Purchase Labour	0.13 hour	0.04 hour	0.08 hour
Stocking Labour	0.13 hour	3.50 hour	(3.38 hour)
Rinsing Labour	0.00 hour	4.38 hour	(4.48 hour)
Dishwashing & Drying Labour	1.17 hour	7.00 hour	(5.83 hour)
Refuse Disp. Labour	7.00 hour	0.29 hour	6.71 hour
Total Labour	8.43 hour	15.21 hour	(6.79 hour)

Labour required to distribute meals and collect used dishes is the same for both cases and was omitted from the process analysis. Labour to unload collection carts in the kitchen is included in the disposal category for disposable dishes and in the rinsing category for reusable dishware.

Contacts

Governmental

Office of Waste Reduction Services
Departments of Commerce and Natural Resources
P.O. Box 30004
Lansing, Michigan 48909
(517) 335-1178

Research References

Literature Sources

Case Study - McPherson Hospital in Howell, Michigan
Office of Waste Reduction Services, State of Michigan

4.0 SOURCE REDUCTION

4.2 IC&I Source Reduction

4.2.3 IC&I Source Reduction - Profile # 3

General Overview

Consumer education, social responsibility and environmental issues are important considerations at the People's Food Cooperative (PFC), a member-owned consumer cooperative, in Ann Arbor, Michigan. While many large grocery store chains have just recently made bulk foods available in their retail line - the PFC has been successfully selling bulk foods for 20 years. Its experience demonstrates how bulk food sales coupled with other practices can divert waste in the retail food business.

Case Study / Subject Jurisdiction:

Source reduction through bulk sales at the People's Food Cooperative store located on Packard Street in Ann Arbor, Michigan.

Demographics

Information requested but not provided or available.

Political/ Social Factors

Information requested but not provided or available.

Driving Forces

Consumer education, social responsibility, and environmental issues, in addition to nutrition and health matters, rank as important considerations in store policy at the Packard PFC.

Detailed Description

- Food distribution creates a significant amount of solid waste, and the major areas of waste generation are:
  - Delivery of food to retail outlets.
  - In-store operations.
  - Consumer generation by using or consuming products and discarding the packaging.
- The food distribution industry is responsible for at least 30% of United States national garbage volume.
- PFC was selected as a model food retail store (for this study) for several reasons such as:
  - Successful elimination of packaging from the solid waste stream through bulk merchandising.
  - Other waste diversion activities - reuse, recycling and composting.
- The store has a total membership of 2,400, although approximately 40% of its sales are to non-members.
- Through waste source reduction, reuse, recycling and composting, PFC's Packard Street store has reduced the amount of waste disposed by 86%.

Specific Features

- Program on-going but monitored during 1989.

The PFC store sells a wide variety of products in bulk. There are number of reasons supporting the sales in bulk form:

- By eliminating unnecessary packaging, bulk selling allows the co-op to use limited storage and retail space more efficiently.
- Bulk products often cost less, because hidden costs of packaging are eliminated.
- Bulk products constitute a more efficient product delivery system; consumers take only what they need.
- Eliminating packaging reduces solid waste, not only for the store, but also for the consumer.

The following items were selected for the bulk versus prepackaged goods study:

- Bulk olive oil.
- Packaged olive oil.
- Bulk shampoo.
- Packaged shampoo.

Olive Oil

Bulk olive oil was received by the store in a 19 litre corrugated cardboard cube with a plastic liner. The plastic liner also served as a dispenser for the oil after a reusable spout was attached to the pour hole by the staff.

Bottles used by the bulk customers eventually entered the waste stream. For this analysis, it was assumed that each customer-provided bottle had a 0.5 litre capacity and could hold about 0.5 kg of oil. It was further assumed that each bottle made an average of 5 trips before it was discarded or recycled.

Prepackaged olive oil was available in half litre glass bottles. A unit was a case of 12 bottles packaged in corrugated container with paperboard slats between the individual bottles.

Selling 1 kg of oil in bulk reduced solid waste generation by 0.35 kg.

Shampoo

Both the bulk and prepackaged forms of Nature's Gate Herbal Shampoo were shipped to the PFC store in high-density polyethylene (HDPE) bottles, multi-packed in corrugated containers without slats. Bulk shampoo was packed in a case of four 3.78 l containers, while prepackaged shampoo in a case of one dozen 0.5 l containers. It was further assumed that each bottle used by the customer was refilled an average of 5 times before it was discarded or recycled.

Specific Features (Cont'd)

Bulk shampoo sales reduced waste generation by 0.03 kg per kilogram of product sold.Major findings of the study included:

- Sale of the analyzed bulk items significantly reduced solid waste generation.
- Prepackaged goods were more costly to sell than bulk items. Inventory, display space, and labour for handling and stocking cost more for prepackaged items than for bulk goods, even though bulk products must be weighed and priced at check out.
- Bulk products were sold at a lower retail price and with lower total added costs than prepackaged items. The PFC store made more money on bulk items than it did on prepackaged products.

Waste was further reduced by a wide range of other activities undertaken by PFC store. The following practices addressed source reduction:
- Packaging reduction (on products packaged at the co-op, and also by co-op request on products received from wholesalers).
- Packaging reuse, including sale of products in reusable containers.
- Surplus food donation.

Additional waste diversion was also achieved by composting and recycling some store generated items and returns from customers.

Waste Types and Sources

Grocery products packaging.

Operational Responsibility

- Program implemented and operated by the People's Food Cooperative store in Ann Arbor, Michigan.
- Monitoring project designed and managed by University of Michigan, Solid Waste Research Group, School of Natural Resources.

Contractual Arrangements

Information requested but not provided or available.

Role/ Requirements of Resident, Private/ Public Sectors

Printed information (flyers, brochures) on ways to save money while purchasing products in bulk.

Applicability to North/South, Urban/Rural

Bulk sales and other waste diversion practices at the PFC co-op are transferable to many businesses in the retail food sector.

Factors enhancing transfer:
- Bulk merchandise reduces solid waste generation, storage and shelf space, and total store costs.
- In many instances, converting to bulk sales requires little capital or equipment and can be done with minor changes in retail operation.
- Bulk foods can be sold at a lower retail price, but with greater margins than prepackaged items.
- Through bulk buying, the consumer has control of quantity and is also likely to generate less post-consumer solid waste.

Applicability to North/South, Urban/Rural (Cont'd)

- Other PFC store waste diversion practices divert significant amounts of waste from landfills and can be instituted without substantial cost or change in store operations.

Impediments to transfer:

- Contamination is a greater risk in bulk sales.
- Savings realized through bulk sales are, in part, derived from the transfer of labour to the customer. The additional time and effort required by customers to obtain their goods might impede acceptance.
- Organizational changes and employee training might be necessary.
- A commitment to consumer education is essential.
- Adoption of waste diversion measures not directly related to bulk sales depends on the availability of recycling, composting and food gathering programs.

Recommendations to facilitate the transfer process arising from the PFC experience:

- Review the many different ways the Packard PFC store diverts solid waste.
- Conduct process and cost analysis to identify appropriate waste diversion procedures and estimate costs of implementing a waste diversion plan.
- Appeal to employees to generate ideas and to participate in the development and implementation of waste diversion programs.
- Decide to do it. Make it a company policy to divert waste.
- Start small. Start with one product line or one department.
- Make a commitment to consumer education by providing information on ways to save money while purchasing environmentally sound products.
- Standardize containers store-wide and industry-wide in order to facilitate weighing and pricing of bulk items.

Financing and Economics

Operating Costs

Cost in $CND per Kilogram of Bulk and Prepack Olive Oil

	Bulk	Prepackaged
Wholesale Price	8.24	8.86
Added Costs *	0.45	0.65
Retail Price	13.99	14.44
Margin	5.30	4.93

The total calculated cost of selling a kilogram of bulk oil is about $CND 0.37 less than a kilogram of bottled oil.

Operating Costs (Cont'd)

Cost in $CND per Kilogram of Bulk and Prepack Shampoo

	Bulk	Prepackaged
Wholesale Price	4.06	6.03
Added Costs *	0.53	0.56
Retail Price	7.43	8.19
Margin	2.84	1.60

* Costs incurred by PFC after wholesale purchase, including labour, storage, shelf space, recycling and disposal costs)

The total calculated cost of selling a kilogram of bulk shampoo is about $CND 1.24 less than a kilogram of bottled shampoo.

The difference in costs allows the store to sell bulk products at a lower price and at a greater profit margin than equivalent, prepackaged items.

Administrative Costs

PFC's labour costs are approximately 1.8% of sales.

Financing Arrangements/ Issues

Monitoring project funded by a 1989-1990 Solid Waste Alternatives Program Grant under the Waste Reduction Research and Demonstration category - Michigan Department of Natural Resources.

Performance

Waste Diversion Impact

Selling 1 kg of oil in bulk reduced solid waste generation by 0.35 kg. Bulk shampoo sales reduced waste generation by 0.03 kg per kilogram of product sold.

The Packard People's Food Co-op diverts 39 tonnes, or 87.5%, per year as a result of their broadly based waste diversion practices.
If all stores in food retail sector followed PFC store waste diversion practices, the results from this study indicate that solid waste generation in the State of Michigan could be reduced by as much as 380,000 tonnes annually.

In a two week period in July 1990, the PFC store conducted a waste audit. The results were extrapolated (basing on annual sales) to estimate an annual diversion.

Waste Diversion Impact (Cont'd)

Waste Diversion Audit

	Kilograms
Source Reduction	21,099
Composting	5,931
Recycling	18,016
Refuse	6,456
Total Materials	51,502
Waste Diversion Rate	87.5%

Labour Requirements

Staff consists of 6 full-time employees.

Contacts

Governmental

Office of Waste Reduction Services
Departments of Commerce and Natural Resources
P.O. Box 30004
Lansing, Michigan 48909
(517) 335-1178

Research References

Literature Sources

Case Study - People's Food Cooperative, Ann Arbor, Michigan
Office of Waste Reduction Services, State of Michigan

Section 5

Reuse

5.0 REUSE

5.1 Municipally Initiated Reuse Programs

5.1.1 Salvage Programs

General Overview

Municipally operated salvage programs place an emphasis placed on reuse and reduction with the intent of extending the life of landfills and at the same time educating the public. In 1981, the non-profit agency People of Program, under the direction of the City of Redding developed a drop-off recycling yard on the property of the Benton landfill to salvage reusable materials. In 1989 when the City of Redding took over the facility. The original salvage facility developed into a central drop-off centre that includes salvage operations, sorting of commingled recyclables, and a composting program that diverts 20% of waste generated from landfill.

Case Study / Subject Jurisdiction:

Landfill Salvage Program, City of Redding, California

Demographics

Community type:	Urban
Population:	75,000
Households:	20,000 single family dwellings
	8,000 apartments in multi-unit dwellings
Total Wastes:	340 tonnes/day (Residential and Commercial)

Political/ Social Factors

- In 1981, City of Redding faced a serious landfill siting problem with the Benton landfill having only 3 years left before closure and the idea of a new landfill site drawing significant public resentment.
- City officials were urged to improve recycling efforts as well as establish some type of salvage program/drop-off centre to divert reusable materials from the landfill and extend its life.

Driving Forces

- Public resentment for new landfill site in the City, a strong community feeling to improve recycling efforts, and the City's mandate to improve landfill life and educate the public in terms of reuse and reduction initiated the program.

Detailed Description

- The drop-off centre at the closed Benton landfill serves as a temporary transfer facility for wastes generated in the City of Redding.
- City incorporates a material processing centre, a composting yard, HHW depot and a drop-off centre at the Benton landfill site.
- Non-recyclable wastes are hauled approximately 21 km to West Central landfill, operated by Shasta County.
- Commingled recyclables collected at curbside and dropped off at the facility are hand-sorted and hauled to recycling centre.
- Yard wastes are separated out and composted on site.

Specific Features

- Refuse is collected from residents, businesses and institutions each day and hauled to the West Central landfill.
- Dry recyclables (commingled) are placed in 68 L bin at curbside, collected and delivered to Benton drop-off centre.
- Yard wastes (grass, leaves and brush) are collected at curbside 5 days/week by two side load trucks and hauled to the Benton drop-off centre.

Waste Types and Sources

- Salvage operations at the Benton site collect reusable construction materials, appliances, clothing and miscellaneous household items
- Traditional recyclables collected (aluminum cans, glass containers, ONP and mixed paper).
- HHW wastes collected include: waste oil, latex paint, lead-acid batteries, and old oil filters.
- Yard wastes collected include: grass, leaves and brush for composting program at Benton landfill site.

Operational Responsibility

- From 1981 to 1989, the non-profit agency, People of Progress, operated the original salvage facility, funded by the City of Redding.
- In 1989, the City of Redding assumed the operation of the salvage facility, for economic reasons, and expanded it into a Drop-off centre for both wet and dry recyclables.

Role/ Requirements of Resident, Private/ Public Sectors

- Residents are asked to place all dry recyclables (commingled) into 68 L bin and yard wastes piled at curbside for collection.
- Drop-off centre is also available for residents and businesses to drop-off all wet and dry recyclable and reusable materials.

Public Education/ Promotion/ Training

- Articles on specific aspects of the operations at the Benton Drop-Off centre and the City's recycling efforts are written for local newspapers and in City-wide newsletters.
- A program has been developed by the City's Recycling Coordinator with schools and businesses to emphasize reuse and reduction.
- The City has an information booth that periodically appears in malls and County fair to distribute information on recycling operations.

Material Flow/ Handling Methods

- Dry commingled recyclables from drop-off centre and curbside collection are placed on a large conveyor and hand-sorted by handicapped workers into 3 - 30 m^3 transfer trailers (one each for aluminum cans, glass containers, ONP and mixed paper).
- The City of Redding then sends out a bid sheet to two local material processing centres and sells recyclables for highest price offered.
- Brush and wood wastes are chipped using a tub grinder with wood chips used for both composting and cogeneration.
- Front end loader is used to turn compost pile 1-2 times/week.
- All wet and dry recyclables dropped off at the Benton landfill site are sorted by volunteer staff and handicapped workers from dry recyclables operation.
- Compost is sold to City's Parks Department and the State's Transportation Department (Caltrans) for landscaping purposes.

Residue Management	Materials rejected from processing operations at Benton drop-off centre and sent to West Central landfill with other non-recyclable wastes.
Applicability to North/South, Urban/Rural	Highly applicable to smaller suburban communities.
Multi-Unit Applicability	System incorporates all 8,000 apartments from multi-unit dwellings in curbside collection program to wet and dry recyclables.
Implications for Other Aspects of Waste Management System	- Successful diversion rate of 20% of total municipal solid waste (16% composting, 4% recycling). - The initial salvage operation extended the life of the Benton landfill by 4 years from 1985 to 1989.

Financing and Economics

Capital Costs	- Initial start-up costs for Drop-off Centre $CDN 2,700 from the inception of program in 1989. - Recently built a portable conveyor system for dry recyclables for $CDN 12,700.
Operating Costs	Information requested but not provided or available.
Revenues	Information requested but not provided or available.
End Market Information	- White goods, iron and aluminum sold to scrap metal dealer. - Appliances sold for parts to appliance rebuilders. - Televisions sold for parts to television repairmen. - Mattresses and box springs sold to bedding manufacturer.

Performance

Material Quantities/ Capacity	Information requested but not provided or available.
Unit Capital Costs	Information requested but not provided or available.
Unit Operating Costs	Information requested but not provided or available.
Waste Diversion Impact	Drop-off centre operations divert 20% of total solid waste stream from landfill with 16% from composting and 4% from recycling efforts.
Observed/ Measured Impact on 3R Awareness, Participation	Information requested but not provided or available.
Labour Requirements	- 1 full-time employee. - Volunteers to assist with salvage operations. - Handicapped recycling workers also help with salvage operations.
Employee Health & Safety Issues	Safety meetings are held periodically by City for all employees at Benton drop-off centre.

Design and Siting Requirements/Issues

Environmental Issues	City of Redding is required to have a permit to operate composting facility at Benton site.
Reporting Requirements	Information requested but not provided or available.

Regulatory and Operating Environment

Government Regulations/ Standards	Bill AB939 passed by the State of California in 1989 has established a recycling mandate of 25% diversion by 1995 and up to 50% diversion by the year 2000.

Contacts

Governmental	Peter Roach, Recycling Coordinator City of Redding 760 Parkview Avenue Redding, Calirfornia Tel: (916) 225-4420 Fax: (916) 225-4434

Research References

Literature Sources	Resource Recycling. "Landfill Recycling Programs with a Reuse Element", September 1991.
Personal Communications	Peter Roach, Recycling Coordinator Tel: (916) 225-4420

5.0 REUSE

5.2 Private Sector Initiated Reuse Programs

5.2.1 Diversion of Reusable Construction Materials to Non-profit Agencies

General Overview

The Loading Dock is a non-profit building supply recycler founded in 1984 to collect reusable building materials from manufacturers, building suppliers, home improvements contractors and home owners with supplies left over from their own projects. Collected materials are redistributed to 2,400 non-profit organizations in the State of Maryland.

Case Study / Subject Jurisdiction:

The Loading Dock, Baltimore Maryland

Demographics

Population, City:	790,000
Population, Metro Area:	2,200,000

Driving Forces

- The initiatives prompting the development of the program were: the large amount of waste generated in the construction industry; diverting reusable materials from landfills to extend their life; and the shortage of materials in the community for low income developments.
- The goal of this organization is to increase decent, affordable housing for low income people through recycling.

Detailed Description

Specific Features

- Diversion of more than 19,000 tonnes to date of reusable building materials from landfills in the Baltimore-Washington Region.
- 200 to 250 building manufacturers in the Baltimore-Washington region donate materials on a regular basis and in return are given a tax deduction for materials donated as well as accruing savings associated with landfill disposal fees.
- The Loading Dock has assisted local governments in Prince George's County and Baltimore County in developing paint recycling programs to divert hundreds of litres of toxic waste (paint) from landfills.
- This paint is then redistributed to non-profit groups that serve the low income community.

Waste Types and Sources

- Commercial waste stream is the primary source of materials although some materials come from the residential sector.
- Items collected include carpeting, vinyl flooring, tile, plywood, drywall, caulking and sealants, kitchen cabinets, lumber, paint, bathroom vanity bases, plumbing fixtures, windows, doors, sinks, and ceramic tile.

Operational Responsibility

Privately operated facility by non-profit agency.

Role/ Requirements of Resident, Private/ Public Sectors	- On Saturdays residents of counties surrounding Baltimore can drop off reusable building materials at local landfill. - Businesses can drop off or request pick up for any materials they wish to donate.
Public Education/ Promotion/ Training	- The Loading Dock is constantly soliciting for materials and to let donors know about the organization. They have joined the home builder's association, gone to trade shows and conventions. - The Loading Dock also distributes brochures to all businesses in the Baltimore area promoting their efforts. - Also have periodically been featured in newspapers and magazines in an effort to increase awareness of program.
Material Flow/ Handling Methods	- The Loading Dock has a truck that is taken to landfills & transfer stations and intercepts materials coming to landfill on Saturdays. - Reusable materials from commercial waste stream are either picked up or dropped off at the 1,950 m^2 warehouse and tracked on a computerized inventory system. - Typically between 3 to 4.5 tonnes of materials are collected each Saturday. - The Loading Dock has contractual arrangements with 6 counties with some involved in special paint collection days or siting of permanent Loading Dock containers stationed at particular landfills. - Estimate since 1991 that 40% of materials stored in the warehouse come from the arrangement with the 6 counties.
Residue Management	There is little to no residual from this facility as all shipments of building materials are screened by the Donations Coordinator to ensure they are appropriate to the needs of the organization's clients.
Applicability to North/South, Urban/Rural	- Initially in first 3 years of operation 95% of non-profits were in City of Baltimore. - Now coverage has grown to include surrounding counties including some in Northern Virginia and District of Columbia. - Applicable to large urban area.
Implications for Other Aspects of Waste Management System	Because reusable building materials are diverted from disposal, less disposal capacity is required.

Financing and Economics

Capital Costs	Information requested but not provided or available.
Operating Costs	The Loading Dock's annual operating budget was reported at $CND 440,000 (1992).
Administrative Costs	Information requested but not provided or available.
Revenues	- The Loading Dock charges 10% of the value of materials to cover expenses associated with pick up and storage. - All costs to non-profit agencies assessed to cover expenses for moving and storage of materials. - In 1991 retail value of usable supplies about $CND 1,300,000 (1991).
End Market Information	The Loading Dock has a mailing list of over 2,400 non-profit agencies which it serves including large Catholic, Jewish and black charity groups, non-profit housing development organizations, day care and senior citizens centres, YMCAs and individual homeowners referred by another non-profit agency.
Financing Arrangements/ Issues	- Initially funded by a $CND 44,500 (1984) grant from Enterprise Foundation's Rehabilitation Work Group and the Morris Goldsecker Foundation. - The Loading Dock became self sufficient in 1991.

Performance

Material Quantities/ Capacity	In 1991 the 1,950 m^2 facility handled approximately 6,400 tonnes of reusable building materials.
Overall Unit Cost	Information requested but not provided or available.
Unit Capital Costs	Information requested but not provided or available.
Unit Operating Costs	$CND 69/tonne.
Waste Diversion Impact	Information requested but not provided or available.
Labour Requirements	Currently facility has 11 full-time employees along with over 3,000 hours of volunteer work per year.
Labour Skills Required	Minimal skill level required to sort and handle materials.

Design and Siting Requirements/Issues

Stakeholder Roles	Information requested but not provided or available.
Approvals Process, Timing Costs	Information requested but not provided or available.
Environmental Issues	The diversion of reusable building materials assists in providing decent affordable housing for the poor as well as prolonging the life of landfills.
Conditions of Approval	Information requested but not provided or available.

Reporting Requirements — Information requested but not provided or available.

Regulatory and Operating Environment

Government Regulations/ Standards — Facility meets applicable regulations and standards.

The State of Maryland has classified the Loading Dock as a 501 non-profit agency serving other non-profit agencies and is exempt from sales tax or other State taxes applied to businesses.

Industry Standards — Facility meets applicable industry standards.

Contacts

Private Sector

Hope S. Cucina, Executive Director
The Loading Dock
2523 Gwynns Falls Parkway
Baltimore, Md 21216
Tel: (410) 728-3625

Note: Loading Dock officials may charge for consultations

Research References

Literature Sources

Biocycle. "Diverting Commercial Building Materials", October 1992

Catonsville Times. "The Loading Dock Seeks Leftovers", May 12, 1993

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The Daily Record. "Loading Dock is Haven for Builders' Surplus Supplies", February 7, 1992.

Howard County Sun. "Loading Dock Collects Recyclable Building Materials", June 5, 1991.

National Home Centre News. "Group Commits to Providing Materials to the Needy", March 18, 1991.

Action - Northern Virginia Building Industry Association. "Debris Dumping Dilemma", March/April 1990.

Personal Communications

Hope S. Cucina, Executive Director The Loading Dock

Leslie Kirkland, Assistant Director The Loading Dock

Section 6

Dry Recyclables

6.0 DRY RECYCLABLES

6.1 Curbside Container and Collection Approaches

6.1.1 Cart Programs

General Overview

Over the years since the inception of the first program, several different concepts for collecting recyclables at the curbside have been tried. In order for any one method to be successful in a given community it must address three fundamental issues: 1) effectiveness in capturing a high quality recyclables; 2) ability to encourage participation and 3) cost effectiveness. Traditionally, in Ontario, curbside collection of recyclables has been undertaken using the blue box and dedicated recycling vehicles. This case study examines a program which uses roll-out carts to collect recyclables at curbside.

Case Study / Subject Jurisdiction:

Drummondville, Quebec

Demographics

Community Type:	Urban	Land Area:	32.6 km^2
Population:	37,300	Population Served:	37,300
Households:	17,800	Households Served:	17,800
Total Residential Waste			15,600t

Political/ Social Factors

- Cart based system for collection of wastes in place since 1986.
- SHAEFER, a roll-out cart manufacturer approached Drummondville with a proposal to implement a cart based program for the collection of waste.
- Survey results following 1 year pilot project indicated a high level of satisfaction.
- After 4 years, similar type program tested for collection of recyclables.
- Cart based curbside recycling program described in City by-law.
- Improved aesthetics of carts versus trash cans or bags was principal factor in selection of the cart based system.

Driving Forces

Local environmental groups lobbied the City government to provide pick-up services for recyclables.

Detailed Description

- Cascades, a local waste management firm and end market for recyclables, financed 9 month pilot program for collection of recyclables.
- City supplied roll-out carts to residents for sorting of recyclables.
- Cost of individual roll-outs - $CND 100 for 240 L cart; $CND 145 for 360 L cart.
- Same vehicle used for collection of garbage also used to collect recyclables.
- Only residential sector is serviced with recycling.
- Sorting facility is located 3 miles from the City.

Specific Features

- Recycling program in operation since 1992.
- 240 L roll-out carts are provided to single family dwellings
- Combinations of 1 or more 240 L or 360 L carts provided for multi-units dwellings, based on 120 L per unit:
  - 2 units - 1 x 240 L cart
  - 3 units - 1 x 360 L cart
  - 4 units - 2 x 240 L carts
  - 5 units - 1 x 240 L and 1 x 360 L carts
  - 6 units - 2 x 360 L carts
- All other multi-unit dwellings served by steel drop-off depots placed in strategic locations throughout city.
- Refuse collection provided once per week.
- Collection provided every second week on same day as refuse collection.
- Curbside collection vehicles include rear packers with two (2) cart lifters and fully automated side loading vehicle.
- Different coloured carts are used, grey charcoal for waste and green for recyclables materials.
- Carts paid for through taxes but remain the property of the City.
- Cost of carts amortized over 5 year period at $CND 30/yr - this item shown separately on tax bill.
- Participation not mandatory however payment of taxes for program is.

Waste Types and Sources

- Paper including fine paper, newsprint, photocopy paper, envelopes, books, magazines, telephone directories, brown paper bags, kraft paper, flour and sugar bags, and flyers.
- Cardboard including OCC, egg cartons, cigarette cartons, boxboard.
- Glass - clear and coloured food and beverage containers.
- Plastic - plastic plates, utensils and pop bottles (PET), HDPE, medicine bottles.
- Ferrous and non-ferrous metals - food and beverage cans, aluminum plates, bottle lids.
- Materials collected commingled in cart.

Operational Responsibility

- Recycling facility is privately operated.
- City contracts private hauler to provide collection services.
- Same contractor provides pick-up for both waste and recyclables.

Contractual Arrangements	- Purchase of carts from manufacturer amortized over 5 year period. - City collects funds to finance carts from property taxes.
Role/ Requirements of Resident, Private/ Public Sectors	- City responsible for operation and administration of program. - Residents separate recyclables into roll-out cart and place at curbside for collection. Participation in program is voluntary. - Food containers, plastic glass or metal, must be thoroughly rinsed before placement in cart, wax paper linings must be removed from cereal or similar type boxes if present. - Carts must be placed at the curb before 8 am. on collection day. - Collection, haulage and processing of recyclables contracted out to private sector.
Public Education/ Promotion/ Training	- City responsible for public education. - Brochures and radio public service announcements have been used promote the program. - Educational material has been distributed to schools and in shopping malls. - Environmental group, 'Bloc vert', and schools have played an active role in the promotion of the program. - Newsletter is produced and distributed to all residents every 3 months. - Newsletter serves to inform and educate residents about the program.
Material Flow/ Handling Methods	- Materials collected in carts over two week period and placed at curbside. - Front loading collection vehicle lifts cart using hydraulic forklift attachment. - Materials are dumped into the vehicle, cart is replaced at curbside. - Material transported directly to facility where it is sorted, bulked and shipped to end markets.
Residue Management	- Level of contamination of material - 5%. - Contamination is removed from material at sorting facility.
Key Issues in Municipal/ Resident Acceptance	- Diversion of wastes from landfill. - Cost savings due to increasing tip fee at landfill. - Garbage collection vehicles can also be used for collection of recyclables. - Convenient for residents - same systems as for refuse.
Multi-Unit Applicability	Applicable, as demonstrated, for multi-unit dwellings up to 6 units.
Implications for Other Aspects of Waste Management System	Waste to landfilled has decreased 16%.

Financing and Economics

Capital Costs	- Carts purchased on a 5 year payment program. - Cost of cart recovered by City through additional property taxes. - Cost of cart amortized over 5 years at $CND 30/year.
Operating Costs	- For collection of recyclables - $CND 480,000/yr. - For garbage collection - $CND 650,000/yr.
Administrative Costs	Information requested but not provided or available.
Revenues	- Contractor of sorting facility retains all revenues from sale of sorted material. - Prices paid by end markets for material unknown.
End Market Information	- Glass is sent to Consumers Glass. - Metal is sent to Alcan. - Paper, OCC and plastic are sent to Cascades.
Contractual Arrangements	- One contractor handles collection of both wastes and recyclables. - City has contract with operator of the sorting facility. - Flat rate charge for collection services (i.e. not tonnage based).
Setting/ Adjusting Rates	Terms of contracts for collection (waste and recyclables) and sorting - 5 years - rates adjusted annually.

Performance

Material Quantities/ Capacity	- Capacity of sorting facility - 6,000 tonnes/yr. - Capacity of garbage collection vehicle - 32 yards. - Capacity of recycling vehicle - 27 yards. - 2,500 tonnes/yr diverted from landfilling.
Overall Unit Cost	- Tipping fee at sorting facility - $CND 40/tonne. - Tipping at landfill - $CND 45/tonne.
Durability/ Downtime	Waste collection vehicles used for collection of recyclables when not in use.
Waste Diversion Impact	Increase in waste diversion since start of program - 30%.
Observed/ Measured Impact on 3R Awareness, Participation	- Set-out rate of roll-out - 95%. - High level of participation from multi-unit dwellings. - Drop-off depots placed around City, need to be emptied every two weeks.
Labour Requirements	To operate collection vehicles - 2 people for rear loading vehicle, 1 person for side loading automatic vehicle.
Net Employment Impact	- Sorting facility - 20 - Collection contractor - 6

Employee Health & Safety Issues

- No additional health and safety issues have been raised by implementation of recycling program.
- Employee training and liability insurance responsibility of contractors.

Design and Siting Requirements/Issues

Stakeholder Roles

- Before embarking on cart based program, City investigated similar programs in the Cities of Sherbrooke and Granby, Quebec.
- 9 month pilot project conducted before implementation of full scale recycling program.

Contacts

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Research References

Personal Communications

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6.0 DRY RECYCLABLES

6.1 Curbside Container and Collection Approaches

6.1.2 Co-Collection Programs

General Overview

Over the years since the inception of the first program, several different concepts for collecting recyclables at the curbside have been tried. In order for any one method to be successful in a given community it must address three fundamental issues: 1) effectiveness in capturing a high quality recyclables; 2) ability to encourage participation and 3) cost effectiveness. Traditionally, in Ontario, curbside collection of recyclables has been undertaken using the blue box and dedicated recycling vehicles. This case study examines a program which uses blue bags co-collected with the garbage.

Case Study / Subject Jurisdiction:

Omaha, Nebraska

Demographics

Community Type:	City
Population:	335,795
Households:	133,842
Households Served:	100,000
Total Residential Waste:	117,376t

Political/ Social Factors

- State of Nebraska's Integrated Solid Waste Management Act:
  - 25% diversion by July 1996
  - 40% diversion by July 1999
  - 50% diversion by July 2002
- State landfill bans:
  - Sept. 1994 - yard waste, used oil, lead acid batteries
  - Sept. 1995 - tires, appliances
- Pilot project undertaken to test program.

Driving Forces

- Effort to keep collection costs down while providing recycling services.
- Recover quality recyclables.
- Provide recycling services without breaching minimum tonnage based waste collection contract.

Detailed Description

- City approached in 1988 by investors proposing mixed waste sorting to capture recyclables.
- City adopted concept after presentations to Public Works, City Council and public consultation.
- Contract awarded to private contractor in 1990 to process mixed waste.

Detailed Description (Cont'd)

- To assist contractor and encourage public participation, coloured bag concept developed.
- Original bag program included waste sorted into mint green bags, recyclables into blue bags.
- Facility began operations June 1990. Program fully operational November 1990.
- When contractor went bankrupt in 1991, City elected to continue program using blue bags only.
- Recyclables are source separated and placed into easily identifiable bags.
- Waste and recyclables are collected in same vehicle.
- Bags containing recyclables are sorted and sent for processing, waste is landfilled.

Specific Features

- Program in operation since June 1990.
- Omaha uses **blue** LDPE bags, 49, 113.5 or 125 litre.
- 49 L bag used for containers or newsprint, minimum approved bag thickness no less than 1.35 mil.
- 113.5 or 125 L bag for containers only, minimum approved bag thickness no less than 1.75 mil.
- City tested bags in field conditions to determine min. specifications for use in program.
- Survival rate for approved bags, >90%.
- Private contractor collects wastes and recyclables using existing compactor trucks.
- Garbage and recyclables are placed into same compartment of compactor.
- Compaction is used (337 kg/m^3).
- Bags containing recyclables are sorted from the refuse at the processing facility.
- Wastes loaded onto transfer trailer and hauled to landfill.
- Processing facility owned by City; equipped and operated by private contractor.
- Co-collection services 75% of the households.
- All single family and multi-unit dwelling up to and including four-plexes, provided with co-collection service.
- Multi-unit dwelling of 5 units or more not covered under City's program; have private contracts with waste haulers.
- Source separation of wastes is voluntary.

Waste Types and Sources

- Residential waste stream is targeted.
- Recyclable materials collected include old newspaper, glass, ferrous, aluminum, coloured and clear HDPE, green and clear PET.

Operational Responsibility

- Collection services provided by a private hauler.
- Processing facility operated under contract.

Contractual Arrangements

Haulage contractor uses existing fleet of compactor trucks, no modifications made.

Role/ Requirements of Resident, Private/ Public Sectors

- Separate old newsprint and place in blue bag.
- Blue 34 L HDPE carry out shopping bags acceptable for newsprint only.
- Remaining materials commingled and place at the curb in a 49 or 125 L bag.
- Blue LDPE bags purchased by the resident at grocery store.
- Approximate cost of bags, $ CND 0.15 per 49 L bag, $CND 0.22 per 125 L bag.
- Commercially available bags are used (e.g. First Brands).
- Collection contractor hauls materials to processing facility only.
- Operator of processing facility responsible for separating recyclables from waste, transporting wastes to landfill.
- City recommends appropriate bag thickness based on field studies.
- City produces and distributes promotional/educational materials.

Public Education/ Promotion/ Training

- Pamphlets produced on various topics:
  - reuse, reduction and recycling;
  - yard waste reduction and recycling;
  - used oil, auto battery and antifreeze recycling;
  - a participation guide for blue bag recycling;
  - precycling - shopping to reduce waste.
- Utility bill mailers to remind residents about program requirements.
- Bi-monthly newsletter describing tonnages of each type of material recovered from the waste stream.
- Speakers available to talk to public groups.
- Recycling information hotline available.
- City responsible for all publications and educational programs.

Material Flow/ Handling Methods

- Recyclables separated from refuse stream and bagged separately.
- Recyclables and refuse collected at curb and placed into same vehicle.
- Materials hauled to transfer station or recycling centre where bags are sorted.
- Garbage is transported to a landfill, recyclables are sent for processing.

Residue Management

- Some breakage of glass or bags occurs when waste source separated materials are compacted.
- 16% of blue bag material rejected as non-recyclable.
- Problems resulting from use of inappropriate bag (i.e. use of blue bags for refuse, bag thickness less than recommended 1.35 mil).

Key Issues in Municipal/ Resident Acceptance

- Convenience to the residents.
- Collection cost savings for the City.
- Fits into existing waste collection contracts.
- Ongoing bag costs an economic disincentive - may be an obstacle to higher participation rates.
- Public perception that co-collection was counter-productive to source separation.
- Program perceived as "free", no direct incentive to participate.
- (In other programs, volume based collection fees, e.g. $CND 2/bag of refuse; $CND 0.50/ bag of recyclables, provide direct incentive for participation).

Applicability to North/South, Urban/Rural

- May be a more economically feasible option for curbside pick-up of recyclables in rural areas.
- Trade off of low collection cost may be offset by higher processing and handling and transportation costs in urban areas.

Implications for Other Aspects of Waste Management System

- Designed to integrate with existing waste collection contracts.
- Unattended drop-offs provided for those who can not or choose not to participate in curbside program.
- Yard waste reduction program including separate collection and composting.
- Drop-off programs for used oil and car batteries at local gas and automobile service stations.
- Annual Christmas tree chipping program.

Financing and Economics

Capital Costs

- Processing and collection contracted to private firms.
- Processing facility owned by City, processing equipment owned by contractor.
- Equipment costs for processing contractor - $CND 1.27M - 1.53M.
- No additional equipment required by collection contractor.

Operating Costs

- Cost to City - $CND 292,500 (1992).
- Includes co-collection contract, salaries of city staff hired to administer program.

Administrative Costs

Included in operating costs above.

Revenues

- For City, 60% of net revenue or guaranteed minimum net revenue, whichever is greater, from sale of recyclables.
- Guaranteed minimum net revenue ($ CND):
  - Newspaper - $49/tonne.
  - HDPE plastic - $140/tonne.
  - PET - $140/tonne.
  - Aluminum - $840/tonne.
  - Steel cans - $56/tonne.
  - Glass (all 3 colours) - $91/tonne.
  - Blue Plastic Bags - $76/tonne.
  - Old Corrugated Cardboard - $28/tonne.
  - Kraft paper - $42/tonne.

End Market Information

- Information requested but not provided or available.
- Responsibility of processor to market the materials.

Financing Arrangements/ Issues

Program financed through general funds (property and sales taxes).

Contractual Arrangements

- Private hauler's fees are per ton (US), based on a minimum guaranteed tonnage.
- Cost per tonne $CND 44.96 - $0.80/tonne/km for transportation in excess of 9.5 km from collection centroid.
- Only one collection sector incurs this charge.

Setting/ Adjusting Rates

- Rates paid to contractors established at time of contract for duration of contract.
- Rates adjusted annually using consumer price index (CPI).

Performance

Material Quantities/ Capacity

1991
- 3,296 tonnes source separated materials received.
- 2,661.8 tonnes materials recovered.
- 634.2 tonnes residue (19.25%).

1992
- 5,464 tonnes source separated materials received.
- 4,582 tonnes materials recovered.
- 882 tonnes residue (16.15%).

1993
- 2749 tonnes source separated material received (to May 1993).
- 2343 tonnes materials recovered.
- 406 tonnes residue (14.75%).

Overall Unit Cost

- $CND 79.57/tonne (1992) for each tonne of commingled, co-collected received at the sorting facility
- Takes into account:
  - Co-collection and haulage of bags to sorting facility.
  - Revenue from sale of material.
  - Sorting and processing of recyclables.
  - Transportation to and disposal of waste at landfill.
  - Facility and administrative fee.

Unit Capital Costs	Information requested but not provided or available.

Unit Operating Costs	- For 1992 (all costs quoted in $ CND):
	  - co-collection and haulage costs - $44.96/tonne.
	  - receipt of co-collected material and separation of blue bags - $7.90/tonne.
	  - transportation of waste to disposal site - $4.06/tonne.
	  - processing of recyclables - $133.81/tonne.
	  - landfill tip fee - $17.43/tonne.

Energy Consumption	Information requested but not provided or available.
Durability/ Downtime	Information requested but not provided or available.
Waste Diversion Impact	- 1991 - 2.28% of co-collected material. - 1992 - 4.11% of co-collected material. - 1993 - 5.48% of co-collected material.
Observed/ Measured Impact on 3R Awareness, Participation	Participation rate 52 - 54%.
Labour Requirements	1 person/vehicle for co-collection.
Labour Skills Required	Low.
Net Employment Impact	- Processing contractor employs 30 to 40 people. - 2 additional staff at City to administer program.
Employee Health & Safety Issues	- Responsibility of contractors. - No additional concerns presented by start-up of program.

Design and Siting Requirements/Issues

Stakeholder Roles

State:
- State legislation on waste diversion targets and landfill bans.

City:
- Hires contractors.
- Administers program.
- Responsible for public education and promotion.

Haul contractor:
- Provides collection of waste and recyclables.
- Provides collection of yard waste.

Processing facility contractor:
- Sorts recycling and garbage bags.
- Transports waste and processing residue to landfill.
- Responsible for marketing and sale of recyclable material.

Public:
- Participation in program.

Approvals Process, Timing Costs

- City's recycling discussions start fall 1987.
- Bids for waste sorting let 1989.
- Contract for operation of sorting facility awarded Jan. 1990.
- Mixed waste sort (using 2 colours of bags) with co-collection starts July 1990.

Contacts

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Research References

Literature Sources

Resource Recycling, March 1993, Pgs. 39-49

Personal Communications

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6.0 DRY RECYCLABLES

6.2 Urban Drop-off (Depots) and Collection Approaches

6.2.1 Urban Depots in Conjunction with Curbside Collection

General Overview

The County of Hannover, Germany utilizes a plastic bag based system to collect separated recyclables, yard waste and residuals from curbside. Depots are also widely available for newspapers, glass, plastic and yard waste and play a significant role in the system.

Case Study / Subject Jurisdiction:

Hannover County, Germany

Demographics

Community Type: Urban
Population: 590,000

20 cities and municipalities

Detailed Description

Specific Features

- Curbside collection is in place across the county using plastic bags to collect source separated materials.
- Separate marked bags are used for yard wastes, clear glass, coloured glass, metals, plastics, paper and residuals (seven different bags).
- Bags are purchased in grocery stores with residuals bags being more costly.
- Bulky wastes, such as appliances, are collected two to three times within a year.
- In addition to the "bag program" a system of depots are in place to increase householder's waste management options including:
- Features of the depot system include:
  - Igloo containers used for glass, plastics and paper
  - 20 m3 containers for yard waste
  - density of 3,700 inhabitants/location
  - located on public and private land (e.g., store parking lots)
  - all depots are unmanned
  - there is no charge for depot use
- 1,170 1.1 m3 containers for bundled newspapers located in public areas with user density of 500 inhabitants/location.

Waste Types and Sources

- Seven waste types as noted above, are separated at curbside.
- Depots accept glass, newspaper, plastics and yard waste.
- The system is designed for residential wastes only.

Role/ Requirements of Resident, Private/ Public Sectors

- Weekly Collection of bundled paper has been carried out in some areas since 1983 utilizing a municipal waste collector and three private firms. The county has subsidized paper collection since 1988.
- All other materials are collected by municipal collectors.
- Residents have the choice of curbside collection of recyclables at a per bag fee or free use of depots.

Public Education/ Promotion/ Training

Information requested but not provided or available.

Key Issues in Municipal/ Resident Acceptance

- The combination of pay by the bag recyclables collection and free use of depots provides residents with a variety of choices.
- The depot provides householders with a lower cost option for managing recyclables and reduces storage problems for those who may have limited space.
- Availability of depots in public areas, particularly in the case of the high density distribution for newspaper depots contributes to user convenience.
- Complaints are received about noise at public depots (e.g., glass breakage).

Applicability to North/South, Urban/Rural

- The combination of curbside and depot collection allows municipalities within the county to respond to the needs of their particular community.

Multi-Unit Applicability

Information requested but not provided or available.

Financing and Economics

Information requested but not provided or available.

Performance

Material Quantities/ Capacity

- Collection through bag and depot systems in 1991:
  - Yard waste - 46.0 kg/capita
  - Glass - 33.0 kg/capita
  - Metals - 5.0 kg/capita
  - Plastics - 0.3 kg/capita
  - Paper - 30.0 kg/capita
  - Total - 114.3 kg/capita
- Further diversion is accomplished through home composting and reduction practices.
- Waste generation rates information was requested but was unavailable.

Research References

Information gathered by ITU GMBH, Berlin
Tel: (030) 214-090-30

6.0 DRY RECYCLABLES

6.3 Rural Drop-off (Depots) and Collection Approaches

6.3.1 Rural Depots as an Alternative to Curbside Collection

General Overview

Rural communities, with large land areas and low population density, often must consider alternatives to curbside recyclable collection in an effort to manage system costs. In this case study, Pictou County, Nova Scotia, responds to the recycling needs of a diverse community by utilizing one permanent depot site and 69 temporary collection points served by a mobile trailer system.

Case Study / Subject Jurisdiction:

Pictou County, Nova Scotia

Demographics

Community Type:	Rural	Land Area:	277,400 ha
Population:	49,000	Households Served:	16,000
Households:	16,000		

This county is comprised of 17 municipal units (rural areas), towns and villages.

Political/ Social Factors

- A standard base level of service was required in all municipal jurisdictions.
- It was recognized however that public interest and demand for recycling services varied across the County; the system had to be flexible enough to accommodate these differences.

Driving Forces

- Provincial Diversion Targets (voluntary)
- 10% - 1994
- 15% - 1996
- 50% - 2000

Detailed Description

Specific Features

- One central depot location is open five days per week.
- A mobile depot system with temporary drop off locations has been developed to respond to community needs.
- A roll off container truck and a trailer each with a set of collection bins is utilized.
- Two sites can be served each trip, i.e., the trailer is left at one site and the main vehicle moves to a second location.
- An attendant remains at each temporary depot site during operation to assist in sorting and to maintain cleanliness at the site.

Specific Features	- The system of sites serviced based on the volume of materials expected. - Ten locations are served once per week. - Each of the 17 rural municipal units have two locations which are visited one day per month. - Villages are generally served twice per month. - The system is flexible to respond to community interest and utilization. - Year round operation is provided.
Waste Types and Sources	- System is designed for the residential waste stream - Depot accepts old corrugated cardboard, old newspaper, tin and aluminum cans, glass and mixed plastics. - Sites will accept IC&I materials but IC&I sector is encouraged to use private waste management services.
Role/ Requirements of Resident, Private/ Public Sectors	- Residents bring recyclable to the depot sites. - The County maintains the collection system, staffs the depots and provides community out reach and information materials.
Public Education/ Promotion/ Training	- Advertising and promotional materials $CND 17,000 over past 20 months. - One staff person assigned to community outreach discussing 3Rs with schools, church groups, etc. - Promotional information is distributed at the depot sites.
Material Flow/ Handling Methods	Collections from temporary sites are delivered to the central depot for further sorting if required.
Key Issues in Municipal/ Resident Acceptance	- Key issue for residents is convenience, where warranted, the County can respond with more service days, locations or hours of operation. - 232 households on average served per depot though actual service level varies considerably; i.e. frequency and hours of operation at each location. - Information on depot schedule very important; community outreach a key element in the communication strategy.
Applicability to North/South, Urban/Rural	Mobile system responds to rural character and low population density.
Financing and Economics	
Capital Costs	$CND 120,000 initial investment in roll off container truck and trailer.
Operating Costs	1991 operating costs were $CND 119,450, net of revenues.
Revenues	Information requested but not available.
Performance	The figures reported here represent 1991 system cost and performance (RIS 1993).
Material Quantities/ Capacity	49 kg/hh recyclables collected.

Unit Operating Costs

- Annual operating cost/tonne $CND 152.
- Annual operating cost/household $CND 7.

Energy Consumption

- Energy consumption through transportation of materials to the depot by individual homeowners minimized by increasing drop off locations.
- Resident trips often combined with other activities, e.g., shopping.
- Roll off truck and trailer system allows one vehicle trip to service two sites, reducing overall transportation costs.

Waste Diversion Impact

Residential sector diversion estimated as 9 to 10%; overall diversion 3 to 4%.

Contacts

Governmental

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Research References

Literature Sources

Ontario Depot Study Report. Prepared for Ontario Multi-material Recycling Inc. Prepared by Resource Integration System Ltd., March 1993.

Personal Communications

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6.0 DRY RECYCLABLES

6.4 Processing of Dry Recyclables

6.4.1 Processing of Recyclables Using Low Manual/ High Automation

General Overview

An important step in the recycling of dry materials involves the sorting and processing of items into a form suitable for shipment to market. Materials can be sorted at curbside or at material recovery facilities (MRFs). The sorting operation at MRFs can be either manual or automated or a combination of both. Presently in Ontario most material is sorted at curbside, although an automated CRINC facility has recently begun operations in Toronto. When sorting is done at most Ontario MRFs it is generally accomplished through the manual picking of various material types. This case study presents a low manual highly automated MRF, as an alternate to this approach.

Case Study / Subject Jurisdiction:

High automation MRF, in Johnston Rhode Island.

Demographics

Population served: 700,000

- Demographics - 95% single family residences 5% multi unit dwellings.
- Serves residential sector only.
- Serves 10 communities of varying size in northern Rhode Island.

Political/ Social Factors

Flow control legislation guarantees supply of material to facility.

Driving Forces

- 1989 State legislation to provide 25% waste diversion from municipal landfill.
- New Legislation 70% waste diversion target.

Detailed Description

The Rhode Island Solid Waste Management Corporation (RISWMC) has implemented a 180 tonne per day low manual high automation material recovery facility (MRF) in Johnston. The facility uses technology developed by Maschinenfabrik Bezner of West Germany supplied through New England CRINC, to process co-mingled container material and fibre collected from a curbside collection program.

Specific Features

- 3,700 m^2 (40,000 ft^2) floor area.
- Co-mingled container and fibre lines.

Waste Types and Sources

- Co-mingled container material processed (percentage figures relate to portion of Co-mingled material input):
  - Aluminium containers 3%
  - Steel containers 12%
  - High density polyethylene (HDPE) 3%
  - Polyethylene terephthalate (PET) 5%
  - Glass containers (green/brown/clear) 67%
  - Residue ± 10%
- Fibre (newspapers).

Operational Responsibility

Municipally owned/privately operated by CRINC.

Contractual Arrangements

- Contractual arrangements between RISWMC and CRINC:
  - CRINC receives basic tipping fee from RISWMC $CND 17.60 (1993) per tonne.
  - CRINC shares in revenue from sale of product.
  - CRINC pays penalty for landfilling residue in excess of 25% of co-mingled input stream.

Role/ Requirements of Resident, Private/ Public Sectors

Residents required to set out materials for collection and ultimate delivery to MRF.

Public Education/ Promotion/ Training

Public education on materials that can be recycled has had significant effect on plant residue quantities.

Material Flow/ Handling Methods

Co-mingled Container Line: Front End

- Live bottom floor hopper approximately 10 m long fed by front end loader.
- Hopper conveyor - 1,200 mm wide flat belt.
- Hopper conveyor speed regulated by wands at head pulley discharge (avoids surges).
- 1,200 mm wide inclined belt conveyor elevates material some 7 m .
- 90° flow turn to flat horizontal and picking belt - where residue is removed to and placed on a residue conveyor.
- Magnetic belt separates ferrous metals at head pulley of residue picking belt.
- Plastics, aluminium, glass feed to vibratory screen (fines to residue, oversize to chain curtain).
- Vibratory screen feeds 2 chain curtain systems.
- Chain curtain - 3 moving curtains of weights suspended by chains moving across an inclined belt conveyor.
- Light materials move parallel with chains and are transferred to the plastic/aluminium line.
- Heavy materials fall down to lower edge of inclined chain curtain conveyor and are transferred to the glass processing line.

Material Flow/ Handling Methods (Cont'd)

Plastic/Aluminium Line
- Aluminium is separated from the plastic by eddy current separators.
- Plastics are fed to a picking conveyor where non-plastics and HDPE are picked off manually.
- Aluminium cans are flattened and blown into trailers.
- PET bottles are perforated and baled (dedicated baler for PET stream).
- HDPE is shredded and transferred to cartons.

Glass Processing Line
- Glass is sized via vibrating screen, 50 mm and less to residue, oversize to glass picking conveyor.
- Green/brown glass and reject materials are picked off the conveyor manually.
- Clear/green/brown glass transferred by separate conveyors to 3 storage silos (25 tonnes each).
- Glass storage silos feed common belt conveyor for alternate transfer to outside container.
- Steel cans as separated by the magnetic separator are shredded and screw conveyed to an outside dump trailer.

Fibre Line
- Approximately 120 tonnes per day.
- 2½ shift operation.
- Newspaper cleaned by two pickers on tipping floor.
- Bollergraff baler is used.

Residue Management

Residual materials comprising approximately 9% - 13% of the input (almost entirely mixed glass under 50 mm) sent to landfill.

Applicability to North/South, Urban/Rural

- Applicable to areas generating large quantities of material.
- Material could come from both urban and rural areas.

Implications for Other Aspects of Waste Management System

Plant requires input feed of two material streams, co-mingled container materials and news.

Financing and Economics

Capital Costs

- Process equipment	- $CND 2.5 million
- Building	- $CND 4.5 million
Total	$CND 7.0 million (1989)

Operating Costs

$CND 2.2 million per year.

Administrative Costs

Included in operating costs, breakout not available.

Revenues

- Annual product revenues - $CND 1.9 million.
- About $CND 32 per tonne.

End Market Information

- News - 14 customers.
- Glass - NYS bottling/Anchor Glass.
- Aluminum - Reynolds.
- Steel Cans - AMG Resources Corporation.
- HDPE - Eaglebrook Plastics.
- PET - Wellman Plastics.

Financing Arrangements/ Issues Facility financed with Revenue Bonds and state waste management authority funds.

Performance

Material Quantities/ Capacity Typical daily output production:

- News	110 to 130
- Clear Glass	18
- Green Glass	7
- Brown Glass	6.5
- Aluminium	2.0
- Steel Cans	11.5
- HDPE	2.9
- PET	3.8
	180 tonnes per day (approximate)

Overall Unit Cost Assuming capital financed at 10% over 15 years, $CND 52/tonne.

Unit Capital Costs $CND 40,000/tonne of daily capacity.

Unit Operating Costs $CND 37/tonne.

Energy Consumption Information requested but not provided or available.

Durability/ Downtime High availability - shift times extended to process backlogged storage if required.

Waste Diversion Impact Facility diverts approximately 15% of the total residential waste stream.

Labour Requirements

- Operational staff	14
- Supervisory/managerial staff	5
Total staff	19

Employee Health & Safety Issues Process generates high noise levels, workers must wear hearing protection.

Design and Siting Requirements/Issues

Information requested but not provided or available.

Regulatory and Operating Environment

Government Regulations/ Standards.

- Facility complies with applicable regulations and standards.
- Flow control legislation used to direct material to facility.

Industry Standards

Facility meets industry standards.

Contacts

Stephan Katz
CRINC Marketing Manager
New England CRINC
12 Elizabeth Drive
Chelmsford, Massachusetts, Zip Code 01824
(508) 250-4800.

Adam Marks
CRINC Plant Manager and former RISWMC Manager (RISWMC manager position presently vacant), 401-944-1501 (Johnston Plant).

Research References

Literature Sources

- Government Advisory Associates Inc., Materials Recovery and Recycling Yearbook - 1993
- Waste Age, Rhode Island's State-of-Art Plant, September 1989

Personal Communications

See contacts listed above.

Section 7

Organics

7.0 ORGANICS

7.1 Residential On-site Mid-scale Composting

7.1.1 Residential On-site Mid-scale Composting - Profile # 1

General Overview

While composting in residential backyards is becoming more common, this approach has not yet been employed on a community basis. A 3 year decentralized community composting pilot project was conducted in Zurich - Wittikon, Switzerland from 1988 to 1990. After that date a full scale program was implemented covering many communities in Zurich. Shredding and composting services were offered to the residents for their yard waste, while the food waste was composted (by the participants of the program) in community composting sites.

Case Study / Subject Jurisdiction:

Decentralized composting pilot project in Zurich - Wittikon, Switzerland.

Demographics

Community Type:	Urban
Population:	Wittikon - 9,690
Households:	4,775
- Residents/ha:	94.1
- Single family	9.8%
- Waste generation:	1960 - 150 kg/person
	1990 - 435 kg/person

Political/ Social Factors

Information requested but not provided or available.

Driving Forces

- To reduce incineration.
- To move toward the waste diversion goal of 30 - 40%.
- After the 3 year pilot program a decision was made to give priority to the development of de-centralized composting sites in Zurich. Prior to building a centralized composting facility for organic waste which could not be composted through community composting, a period of 3 - 4 years was given for development of de-centralized composting.

Detailed Description

Specific Features

- The pilot program for de-centralized composting of food waste was conducted from 1988 to 1990, followed by implementation of a full scale program.
- Composting units are purchased by groups of residents (there is no preference to any specific type of composter).

Specific Features (Cont'd)

- Composters are located on municipal land in the vicinity of multi unit housing (in Wittikon area during the pilot project).
- Municipality provides an educational course, information for participants, a composting hot-line, and special advisors.
- Free shredding service provided under contract to the municipality for brush at the composting sites on 10 designated days throughout the year.
- Over the 3 year period of the study the percentage of the population which had access to community composting rose from 16% to 35%.
- The number of community composting sites increased from 21 to 59 during the pilot program.
- In winter of 1991, when full scale community composting project was implemented, the number of composting sites reached 482 with a projection of at least 400 more sites established during 1992.
- A minimum of 3 households are required to create a community composting site. Of 482 sites existing in the winter of 1991, 66% of sites involved 3 - 30 households.
- Interested people, usually those who contacted their municipality inquiring what to do with their organic waste, were told about community composting and offered help (how to create a group, how to go about composting).
- Landlords have to approve a choice of a composting site, if on their property.
- Almost all food waste is recommended to be composted (including meat, bones, grease, dairy products and pet litter). The only items not recommended are paper and diapers.
- Each composting site has a list of participants (with addresses and phone numbers) together with a list of duties hanging in a visible location.
- Food waste is brought in small plastic pails (about 3 - 4 l) or any other convenient container and emptied into a covered composting container. Residents, after emptying their food waste into the composter may add some wood chips as a bulking agent, if required.
- After 2 weeks, material is moved from the bin to a pile of older material, thoroughly mixed and covered. After 2 months, the material is moved and covered again, where it remains until it is picked up by residents for use in their own gardens.

Waste Types and Sources

Compostable food waste including meat, bones, grease, dairy products and pet litter.

Operational Responsibility

Project initiated and operated by the municipality.

Role/ Requirements of Resident, Private/ Public Sectors

- Municipality provides land to site community composters (for pilot project only).
- Municipality also provides weekly collection of yard waste on a user fee basis.
- Municipality provides brush shredding on a regular basis.
- Municipality provides assistance and advice on site management.
- Municipality provides twice a year delivery of wood chips (bulking agent) for those sites which don't produce their own.
- Residents source separate organic wastes with food wastes taken to the community composting location and yard wastes set out for collection.
- Residents are responsible for operating community composting sites.

Public Education/ Promotion/ Training

- Educational course available.
- Telephone hotline.
- Personal contact.
- Various types of printed information, e.g.:
  - How to create a community composting group.
  - How to identify a site for composting.
  - How to construct a pile.
  - How to collect organic waste.
  - What can be composted.
  - How to manage a composting site.
  - How much time a participant has to invest.

Key Issues in Municipal/ Resident Acceptance

- Public education program.
- Reasonable access to decentralized composting facilities.
- In a two year period (1990 - 1991) only 7 complaints about rats were lodged.

Applicability to North/South, Urban/Rural

Decentralized community composting can be applicable to any community.

Multi-Unit Applicability

Decentralized community composting is suitable for multi unit dwellings.

Implications for Other Aspects of Waste Management System

Zurich has determined that a mix of decentralized (community/backyard) and centralized (biowaste) collection is required as part of an economically feasible and sustainable organic waste management system.

Financing and Economics

Operating Costs

Operating costs for the 3 year project were:

- Public education and compost consulting	$CND 250,000
- Shredding services	102,000
- Yard waste collection	196,000

The per tonne cost to manage all organic wastes in Wittikon declined from $CND 490 in 1988 to $CND 350 in 1989 and $CND 277 in 1990 as a result of the roll out of the community composting program and the resulting increase in tonnages handled by this program.

Administrative Costs

Information requested but not provided or available.

Performance

Material Quantities/ Capacity

- 25 kg/person of compostables recovered annually in multi-unit housing.
- Total compostables recovered from single family housing with gardens increased, over the 3 year period of this project, from 57 tonnes to 105 tonnes.
- Quantities of biowaste composted increased from 25% to 60% over the 3 year project at various decentralized community composting sites.
- The total amount collected at all compost sites increased from 28 tonnes to 111 tonnes per year.

Waste Diversion Impact

- 30% of the collected compostables were composted at the decentralized stations.
- 20% were sent to centralized composting.
- The remaining 50% were incinerated.
- The amount of waste composted increased from 34 kg to 54 kg per person/year.

Observed/ Measured Impact on 3R Awareness, Participation

- Program significantly revived community spirit.
- People feel more empowered in the area of environmental issues.

Labour Requirements

To implement program on a full scale basis, municipality hired 3 full time employees to advise residents on composting issues, to service the hot-line, print information and conduct training courses.

Labour requirements for participants - for a composting site with participants from 50 households, 2.5 hours of work per month are needed from each household.

Contacts

Governmental

Dr. Lemann
Ubsuhrwesen, Zurich
(41-1) 305-7711

Research References

Literature Sources

Abfall Spectrum, 8033 Zurich 3/92
Dezentrale Kompostierung
Ulrich Brunner und Werner Kalunder-Feusi

Community Composting in Zurich - a video tape
W.O.W. No. 26, Video Active Productions, April 1991
Roger Bailey or Paul Connet
Rt. 2. Box 322
Canton, NY 13617
(315) 366 - 8797

Personal Communications

Dr. Lemann
Ubsuhrwesen, Zurich
(1) 305-7711

7.0 ORGANICS

7.1 Residential On-site Mid-scale Composting

7.1.2 Residential On-site Mid-scale Composting - Profile # 2

General Overview

While composting in residential backyards is becoming more common, this approach has not been widely employed on a community basis specifically addressing multi unit buildings. In Marburg a composting pilot study for multi unit dwellings was launched in 1990.

Case Study / Subject Jurisdiction:

A multi-unit composting study in Marburg - Richtsberg, Germany

Demographics

Community Type:	Urban	
Population Served:	6,000	
Population:	70,000	
Households Served:	Phase I	240
	Phase II	600

Political/ Social Factors

Richtsberg (pop. 10,000) is an area of dense multi unit housing built during the 1970's. The city has launched an intensive building improvement program in order to improve the living space and conditions. Residents of Richtsberg are mostly students, retired people and low income families (this is not an established neighbourhood, a lot of moving in and out).

Driving Forces

- More than a half of Richtsberg residents were offered the possibility of gardening projects in stairwell window sills, rooftops, balconies etc.
- The compost produced from the composting projects is to be used to facilitate the garden projects while also contributing to reducing waste.

Detailed Description

Specific Features

- A composting pilot study for multi unit dwellings was launched in 1990.
- On average 12 - 20 apartments per building; some buildings have up to 70 apartments.
- Individual letters were distributed to households inviting them to participate.
- 3 bin composting containers were constructed and erected free of charge.

Specific Features (Cont'd)	- Composters were made from wood with dimensions of 2.5 m by 1 m by 1 m (two one meter sections for compost and one half meter section for amendment/mulch). - Locations were selected by participating households, Office for Housing Improvements and the area environmental agency. - 90 composting sites were established. - 5 litre kitchen biowaste collection containers were distributed during initial personal contact. - Local nurseries assist with aeration of the compost and site management on a 3 to 6 months schedule. - Compost quality meets local standards.
Waste Types and Sources	All kitchen organics.
Operational Responsibility	- Municipally provided funding and administration for the program. - Information and promotion provided by volunteers. - Nurseries provided site supervision and compost aeration under contract to the City.
Contractual Arrangements	Information requested but not provided or available.
Role/ Requirements of Resident, Private/ Public Sectors	- Residents are asked to separate kitchen organics and place these material in the composter. - Public sector provides public education, administration and responds to any requests for information or complaints about odours, pests or location of units. - Private sector provides assistance with compost site supervision and operation.
Public Education/ Promotion/ Training	Promotional campaign included: - Posters. - Brochures, mailings. - Personal contact. - Information evenings.
Key Issues in Municipal/ Resident Acceptance	- Good public information. - Prompt response to complaints.
Applicability to North/South, Urban/Rural	Applicable to any community type.
Multi-Unit Applicability	Designed for multi-unit buildings.

Financing and Economics

Operating Costs	- Promotional materials	$CND 1,023
	- Consulting fees	831
	- Compost box / each	387
	- Kitchen container / each	6
Administrative Costs	Information requested but not provided or available.	

Performance

Waste Diversion Impact	Information requested but not provided or available.
Observed/ Measured Impact on 3R Awareness, Participation	- Residents support their composting program. - Other areas of Marburg are interested in establishing similar composting projects.
Labour Skills Required	Staff skilled in compost training and public facilitation.

Contacts

Governmental	Der Magistrat (Town of Marburg, Environmental Offices) Barfuserstrase 50 35035 Marburg, Germany Dipl. Geograph Jochen Friedrich ph. (64-21) 201-405 fax (64-21) 201-591

Research References

Literature Sources	Einfuehrung, Oeffentlichkeitsarbeit und beratung einer Gemeinschaftskompostierungsanlage, BUND-Dokuments, Goettingen 1992 Dipl. Geograph Jochen Friedrich, Environmental Offices Town of Marburg
Personal Communications	Town of Marburg, Environmental Offices Dipl. Geograph Jochen Friedrich

7.0 ORGANICS

7.2 Curbside Containers and Collection Approaches

7.2.1 Plastic Bag Program

General Overview

Household organics generated within a municipality are typically collected in one of two ways. A curbside collection service can be offered or drop-off sites can be provided where residents and commercial yard waste generators can deliver their material. Curbside collection systems are generally more expensive to operate than a drop-off depot but.typically can collect the widest range of household organics (e.g., yard waste, food waste, other requested compostables such as soiled paper, kitty litter, etc.).

The selection of an appropriate level and type of collection service will be specific to each community. A case study examining the use of plastic bags is provided in this profile.

Case Study / Subject Jurisdiction:

Omaha, Nebraska (United States)

Demographics

Community Type:	Urban
Population:	336,000
Households:	134,000
Households Served:	110,000
Total Residential Waste:	117,400 tonnes

Driving Forces

- Waste diversion from disposal facilities.
- Replace the use of topsoil for daily landfill cover.
- Waste diversion objectives set forth in the State of Nebraska's Integrated Solid Waste Management Act:
  - 25% by July 1996
  - 40% by July 1999
  - 50% by July 2002
- Landfill bans scheduled to be implemented including:
  - yard waste , used oil, lead acid batteries by September 1994
  - used tires, white goods by September 1995

Detailed Description

Specific Features	- Omaha initiated a pilot yard waste collection program in 1987 using 340 litre rollout carts. Use of the rollout carts was discontinued because of cost and capacity limits. - During the same year, biodegradable plastic bags were also tested. These were discontinued because they did not degrade properly at the compost site. - Omaha decided that the use of standard plastic bags was the preferred curbside collection container. - Yard waste, in any type of plastic bag, is collected weekly between April 1 and November 30, using 23 one-person side-loader vehicles. - The composting site is in Iowa and is operated privately.
Waste Types and Sources	It is estimated that collected yard waste from households is comprised of 20% leaves, 60% grass and 20% brush. No information was provided on the method used to estimate the relative percentages.
Operational Responsibility	- Contractor is responsible for collection and processing of yard wastes. - The same contractor collects the garbage.
Role/ Requirements of Resident, Private/ Public Sectors	All collection and processing services are contracted to the private Sector.
Public Education/ Promotion/ Training	No formal public education program was carried out in the City.
Material Flow/ Handling Methods	- Yard waste can be set out at the curb in any type of plastic bag. - It is collected weekly and delivered directly to the composting site. - 500 stops per day are currently achieved using the bag based system. - Estimated that only 300-325 stops per day could be achieved using a cart based system. - Bags are opened primarily by the windrow turner. - Bags are removed from the windrow manually. - Yard waste is also delivered to the composting site from other sources including local parks, municipal buildings, etc.
Residue Management	Information requested but not provided or available.
Applicability to North/South, Urban/Rural	- Applicable to any sized community. - No difficulties associated with implementation in any single north/south, urban/rural sector.
Multi-Unit Applicability	Applicable to low-rise where yard waste is currently managed by curbside collection.
Implications for Other Aspects of Waste Management System	- Yard waste ban will help decrease waste requiring disposal. - Manually debagging is time consuming.

Financing and Economics

Capital Costs	- Yard waste bags are purchased by householders. - Capital costs for collection and composting are the responsibility of the contractor and included in per tonne charges.

Operating Costs	- The contractor is paid $CND 45.30/tonne to collect yard waste. A bonus of $CND 6.50/tonne is paid for every tonne collected per year beyond 13,500 tonnes. In 1992, this bonus amounted to approximately $CND 50,000. - The collection contractor is charged a tipping fee of $CND 24.60/tonne by the composting site operator.
Administrative Costs	Information requested but not provided or available.
Revenues	The compost is not being sold.
End Market Information	- To date no compost has been sold. It is being stockpiled for use as landfill cover. - Due to the end use, compost quality is not a major concern.

Performance

Material Quantities/ Capacity	- It is estimated that 22,000 tonnes of yard waste are available from the 110,000 households (approximately 19% of the residential waste stream). - A total of 21,000 tonnes of yard waste were diverted in 1992 from residential and municipal sources (e.g. parks). - 75% of the yard waste is collected from curbside households (approximately 16,000 tonnes). - Approximately 145 kg of yard waste is collected, on average, from each household.
Unit Operating Costs	Composting processing costs are estimated at $CND 22.50/tonne.
Waste Diversion Impact	- Approximately 14% of the residential waste stream was diverted by the yard waste program in 1992. - It is estimated that the recovery rate for yard waste in 1992 was approximately 73%. - The City is aiming for an 80-90% recovery rate in 1994.
Observed/ Measured Impact on 3R Awareness, Participation	- Over 90% of the households participate in the yard waste composting program. - Some householders have requested that rollout carts become part of the program. As a result, the City is considering allowing rollout carts and also promoting the use of paper bags for yard waste collection. - The City has recognized that if a better quality compost is required, an improved curbside collection system will be required that reduces contamination. It is felt that the use of designated plastic bags, rollout carts or paper bags would improve material quality.
Labour Requirements	Information requested but not provided or available.

Design and Siting Requirements/Issues

Conditions of Approval

Composting site must meet State of Iowa's Department of Natural Resources guidelines.

Regulatory and Operating Environment

Government Regulations/ Standards

- City is considering changing the form of payment for the program to a $/stop from $/tonne. Existing form of payment is currently through municipal taxes.
- The use of any curbside collection container must conform with local bylaws.

Contacts

Governmental

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Omaha, Nebraska
68107 U.S.A.
Tel.: (402) 734-6060
Fax.: (402) 731-8404

Research References

Literature Sources

Taylor, Alison, and Richard Kashmanian. "Study and Assessment of Eight Yard Waste Composting Programs Across the United States." United States Office of Policy, Planning and Evaluation. Washington, DC. 1988.

Personal Communications

Dan Slattery

7.0 ORGANICS

7.2 Curbside Container and Collection Approaches

7.2.2 Paper Bag Program

General Overview

Household organics generated within a municipality are typically collected in one of two ways. A curbside collection service can be offered or drop-off sites can be provided where residents and commercial yard waste generators can deliver their material. Curbside collection systems are generally more expensive to operate than a drop-off depot but typically can collect the widest range of household organics (e.g., yard waste, food waste, other requested compostables such as soiled paper, kitty litter, etc.).

The selection of an appropriate level and type of collection service will be specific to each community. A case study examining the use of paper bags is provided in this profile.

Case Study / Subject Jurisdiction:

Urbana, Illinois (United States)

Demographics

Community Type:	Urban
Population Served:	38,000
Households Served:	12,000
Total Residential Waste:	14,250 tonnes

Driving Forces

- Waste diversion from disposal facilities.
- Yard waste is banned from landfills state-wide.
- The Urbana, Illinois local landfill closed in 1992. The community must now pay to have their waste landfilled at private landfills.
- Yard waste is second largest component of the waste stream behind paper.

Detailed Description

Specific Features

- The program started in the Fall of 1988.
- Originally plastic bags were used to collect yard waste.
- Kraft paper bags are used for collection of leaves and grass; brush is bundled.
- Weekly collection for nine months (March to November) is carried out using two-person, rear packer trucks.

Waste Types and Sources	- It is estimated that 50% of yard waste collected is brush, 35% leaves and 15% grass. This is based on volume and density conversions of 230 kg/cubic metre for leaves and brush and 460 kg/cubic metre for grass. After converting to tonnes, the estimate for the three components of yard waste was calculated.
Operational Responsibility	- Yard waste collection is contracted out by the City. - Several private haulers collect garbage. Urbana still uses a subscription service for waste management (i.e., individual householders are responsible for selecting their own waste collection contractor).
Role/ Requirements of Resident, Private/ Public Sectors	- Each household is responsible for setting up a contract to have their waste collected.
Public Education/ Promotion/ Training	Information requested but not provided or available.
Material Flow/ Handling Methods	- Leaves and grass are collected in paper bags. - Brush is collected bundled. - Yard waste is collected weekly and delivered directly to the composting site. - Bags are opened primarily by the windrow turner. - Bags biodegrade in four to six weeks in the windrows. - Yard waste is also delivered to the composting site from other sources including local parks, municipal buildings, etc.
Residue Management	- There is no residue at the compost site from the use of paper bags to collect compostables.
Applicability to North/South, Urban/Rural	- Applicable to any sized community. - No difficulties associated with implementation in any single north/south, urban/rural sector. - Costs of the kraft bags may not be economical in smaller communities. Economies of scale would bring down the cost of the bags if purchased in larger numbers.
Multi-Unit Applicability	Applicable to low-rise where yard waste is currently managed by curbside collection.

Financing and Economics

Capital Costs	- Yard waste bags are purchased by householders. - Capital costs for collection and composting are the responsibility of the contractor and included in charges per cubic metre.
Operating Costs	- Contractor was paid $CND 16.50 in 1992 per compacted cubic metre for the collection of the yard waste (approximately $CND 40/tonne). - Department of Public Works estimates that it costs $CND 7.50 per cubic metre to process and compost the materials using windrows (approximately $CND 25/tonne).

Administrative Costs	Information requested but not provided or available.
Revenues	Sold 800 cubic metres of compost for $CND 10.00/cubic metre.
End Market Information	- Some is used by the City for parks. - 800 cubic metres of compost were sold to private citizens and landscapers.

Performance

Material Quantities/ Capacity	- It is estimated that 2,850 tonnes of yard waste are available from the 12,000 households (approximately 20% of the residential waste stream). - A total of 2,090 tonnes of yard waste were diverted in 1992 from residential and municipal sources (e.g. parks). - 65% of the yard waste is collected from curbside households (approximately 1,350 tonnes). - Approximately 110 kg of yard waste is collected, on average, from each household.
Unit Operating Costs	Kraft bags cost $CND 0.45 each when purchased in batches of 30,000.
Waste Diversion Impact	- A 10% diversion rate for yard waste was achieved in 1992. - Less than 50% of the yard waste is captured.
Observed/ Measured Impact on 3R Awareness, Participation	- Because of the large number of independent haulers, residents have a number of options (i.e., other haulers) to dispose of their materials. - Possible explanations provided for low capture and participation rates include: cost of the bags, grasscycling, backyard composting, illegal dumping and a lack of cooperation by some haulers. - Participation rates have not been measured. - The use of kraft bags has improved the quality of the compost because of the reduction in the amount of plastic in the finished product. - There is some illegal dumping of yard wastes because of ban at landfills. - There is a concern with contaminants from the material (mostly leaves) picked up by street cleaners in the fall.
Labour Requirements	One two-person, rear packer is used.

Design and Siting Requirements/Issues

Conditions of Approval	- Quality of the leachate and the final compost must meet EPA standards. - Permit application is submitted every three years and includes leachate and compost test analyses.
Reporting Requirements	Every year, the compost site has to report the quantity of material received at the site to the United States Environmental Protection Agency.

Regulatory and Operating Environment

Government Regulations/ Standards

- The use of any curbside collection container must conform with local bylaws.
- Yard waste is banned from landfill sites in Illinois.

Contacts

Governmental

Rod Fletcher
Environmental Coordinator
Department of Public Works
Urbana, Illinois
Tel.: (217) 384-2381

Research References

Literature Sources

Glenn, J., "Taking a Bite Out of Yard Waste", Biocycle, September 1989, pp. 31-35.

Personal Communications

Rod Fletcher

7.0 ORGANICS

7.2 Curbside Containers and Collection Approaches

7.2.3 Biodegradable Specialty Polymer Bag Program

General Overview

Household organics generated within a municipality are typically collected in one of two ways. A curbside collection service can be offered or drop-off sites can be provided where residents and commercial yard waste generators can deliver their material. Curbside collection systems are generally more expensive to operate than a drop-off depot but typically can collect the widest range of household organics (e.g., yard waste, food waste, other requested compostables such as soiled paper, kitty litter, etc.).

The selection of an appropriate level and type of collection service will be specific to each community. A case study examining the use of biodegradable specialty polymer bags is provided in this profile.

Case Study / Subject Jurisdiction:

Borough of Haddonfield, New Jersey (United States)

Demographics

Community Type:	Urban	Land Area:	720 ha
Population:	14,000	Population Served:	14,000
Households:	5,000	Households Served:	5,000
Number of Businesses:	275		
Total Residential Waste:	11,100 tonnes		
Total Commercial Waste:	1,200 tonnes		

Driving Forces

- Grass and small vegetative waste items increase the waste requiring management by 50% in the growing season.
- Tipping fee at the energy from waste facility now stands at $CND 127/tonne.
- Compliance with the State of New Jersey's grasscycling program called "Cut it and Leave it."
- The Borough has been collecting leaves since 1970.

Detailed Description

Specific Features

- Haddonfield is a mature, fully developed residential suburb of Camden, New Jersey and Philadelphia, Pennsylvania.
- The Department of Public Works has its own "tree management department" that serves the more than 10,000 Borough-owned trees that line local streets.
- The "modified" yard waste collection program began June 1, 1993.

Specific Features (Cont'd)	- Public given the choice of setting out their grass, brush and weeds, plants, and leaves in open plastic containers (75 litres); 110 litre paper bags or 150 litre NOVON polymer bags. - NOVON polymer bags are water-resistant, flexible, stretchable, lightweight and thin (2 mil). - See-through bag allows easy identification of contents thereby ensuring compliance with the program. - Compostables are collected on a weekly basis.
Waste Types and Sources	Grass clippings, leaves, small brush, weeds, and garden trimmings from residences and landscapers.
Operational Responsibility	- Curbside collection of waste, recyclables and yard waste is undertaken by Public Works staff. - Waste, recyclables and yard waste is also collected from municipal buildings, parks, etc. by Borough staff (this material is included in "residential waste" as defined by the Borough).
Role/ Requirements of Resident, Private/ Public Sectors	- Householders are required to purchase their preferred organic collection container from two retail outlets in the Borough. - There is no door-to-door delivery of containers other than the initial delivery of three free NOVON polymer bags.
Public Education/ Promotion/ Training	- A flyer outlining what can go into the bags was delivered to households along with three free NOVON polymer bags. The flyer also outlined where additional bags could be purchased. - Announcements were placed in the local paper and municipal newsletter.
Material Flow/ Handling Methods	- Pickup of grass and yard trimmings is once each week on the same day as regular waste and recyclables collection. - Compostables are delivered to a private composting site in Wrightstown, New Jersey (Woodhue Composting Facility). - No bag removal system is required at the composting site for materials collected in Haddonfield.
Residue Management	- No residue is produced using the polymer bags. - Compostables delivered from other municipalities in plastic bags have created de-bagging problems at the site plus require further disposal by landfill. - Studies on compost quality have not been undertaken to date. They are scheduled for later in the program.

Key Issues in Municipal/ Resident Acceptance	- It has been estimated by Borough staff that $CND 91,000 could be saved each year using the NOVON polymer bag based, in part, on the avoided costs of not using the energy from waste facility. - Curbside observations have indicated that residents place more materials in the polymer bags than in paper bags because they are perceived to be stronger. - The expense of removing and disposing of plastic bags can represent 50% of processing costs. - Bags breakdown quickly and, therefore, do not interfere with windrow turning. - Composting site operator reports that the bags breakdown even faster than the paper bags.
Applicability to North/South, Urban/Rural	- Applicable to any sized community. - No difficulties associated with implementation in any single north/south, urban/rural sector. - Cost of the NOVON polymer bags may not be economical in smaller communities. Economies of scale would bring down the cost of the bags if purchased in larger numbers.
Multi-Unit Applicability	Applicable to low-rise where yard waste is currently managed by curbside collection.
Implications for Other Aspects of Waste Management System	Less waste arriving at the energy from waste facility may pose problems in the future unless additional supplies can be found.

Financing and Economics

Capital Costs	- Bags are purchased by householders:
	  - $CND 1.35 for NOVON polymer bag
	  - $CND 0.75 for paper bags
	  - $CND 15.00 for plastic containers (one time price)

Operating Costs	- Tipping fee at the Woodhue Composting Facility is $CND 30/tonne.
Administrative Costs	Information requested but not provided or available.
End Market Information	Information requested but not provided or available.

Performance

Material Quantities/ Capacity	- Haddonfield currently composts (or chips) more than 3,300 tonnes of yard waste per year from all sources. - It is anticipated that 1,000 additional tonnes of yard waste from the residential sector are still sent for disposal.

Waste Diversion Impact	- It is estimated that more than 65% of the yard waste is currently being recovered from the residential sector. - Of the remaining 1,000 tonnes, it is estimated that 750 tonnes will be recovered from the modified yard waste collection program. - If this is achieved, Haddonfield would be recovering approximately 95% of all yard waste generated in the Borough.
Observed/ Measured Impact on 3R Awareness, Participation	- A combined participation rate of 80-90% being achieved through the use of the three container types. - No indication of effect of bag giveaway on participation rate. - A one week sample in mid-July identified that 40% of the sampled households (that participated that week) were using NOVON polymer bags. Additional samples are being taken.
Labour Requirements	Regular two-person rear packer trucks are used.

Design and Siting Requirements/Issues

Environmental Issues	The use of NOVON polymer bags does not require that the composting site operator conduct additional tests.

Regulatory and Operating Environment

Government Regulations/ Standards	The use of any curbside collection container must conform with local bylaws.

Contacts

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Research References

Literature Sources

NOVON report entitled, "Compost Bags made of Biodegradable Polymers Cut Community's Disposal Costs, Benefit the Environment", July 1993.

Letter from Woodhue Ltd. to NOVON Products, July 1993.

Institute of Local Self-Reliance. Beyond 40 Percent: Record Setting Recycling and Composting Programs, 1991.

Institute for Local Self-Reliance. Beyond 25 Percent: Materials Recovery Comes of Age, 1989.

Department of Environmental Science, Cook College and the N.J. Agricultural Experiment Station Rutgers, Leaf Composting Manual for New Jersey Municipalities, 1989.

Personal Communications

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Andy McCabe

7.0 ORGANICS

7.2 Curbside Container and Collection Approaches

7.2.4 Rollout Cart Program

General Overview

Household organics generated within a municipality are typically collected in one of two ways. A curbside collection service can be offered or drop-off sites can be provided where residents and commercial yard waste generators can deliver their material. Curbside collection systems are generally more expensive to operate than a drop-off depot but typically can collect the widest range of household organics (e.g., yard waste, food waste, other requested compostables such as soiled paper, kitty litter, etc.).

The selection of an appropriate level and type of collection service will be specific to each community. A case study examining the use of rollout carts is provided in this profile.

Case Study / Subject Jurisdiction:

Municipality of the District of Lunenberg (Nova Scotia) and the Towns of Bridgewater, Lunenberg and Mahone Bay (Nova Scotia)

Demographics

Community Type:	Urban/Rural
Population Served:	2,900
Households Served:	982

Political/ Social Factors

- The municipalities involved in the study adopted the Solid Waste Management Strategy in the Fall of 1991.
- The Strategy recommended closing the incinerator and adopting a recovery program focusing on recycling and composting.
- The Strategy recommended two stream collection for residential waste.
- It was agreed by District Council that conducting a pilot project would provide needed local information to determine the best approach to recover recyclables and compostables.

Driving Forces

- The two incinerators in operation at the Whynott Settlement are scheduled to close by 1996 and, therefore, methods for diverting material from the waste stream were under investigation.
- Organics and recyclables had not been collected separately prior to the initiation of the pilot project.
- The purpose was to demonstrate the effectiveness and acceptability of a particular method of collecting municipal solid waste from householders.

Detailed Description

Specific Features

- District Council decided not to test the recommended two stream collection system when new information became available. It was decided instead to test a three stream collection system.
- The pilot project started in September 1992 and ended in February 1993.
- Schaefer Systems International Limited provided its "Compostainer" wheeled rollout cart to each household in the study.
- The cart size tested was 240 litres.
- Residents also received a miniature cart for collecting organics in the kitchen.
- Resident were also asked to separate their recyclables and place them in blue bags supplied door-to-door.
- Carts were collected weekly in the urban areas and biweekly in the rural areas.
- All carts were emptied into a standard packer garbage truck modified with a hydraulic lifting device.

Waste Types and Sources

Organics from the kitchen and yard trimmings.

Operational Responsibility

- Waste, compostables and recyclables were collected by a private contractor.
- The organic materials were composted at the Whynott Settlement Solid Waste Site using a basic windrow operation.

Role/ Requirements of Resident, Private/ Public Sectors

- Residents required to separate their organics into the rollout cart and place it at the curb for collection.
- Recyclables (the second stream) were to be placed commingled in the blue bag and set out at the curb for collection.
- Municipal staff kept statistics on the performance of the collection system.

Public Education/ Promotion/ Training

- Prior to implementation, participants were sent a letter providing background information and outlining the purpose of the pilot study.
- News releases provided media coverage of the project.
- Public workshops were held to inform people of the project and how to prepare their materials for collection.
- Letters at the end of Phase 1 and at the end of the Project kept residents informed of progress.

Material Flow/ Handling Methods

- Organics were collected weekly in the urban areas and biweekly in the rural areas.
- Carts were emptied into a standard packer garbage truck modified with a hydraulic lifting device which automatically lifted the cart and dumped the organics.
- Recyclables were collected commingled using a stake truck.
- All materials were hauled to Whynott Settlement (local incinerator/landfill).

Residue Management	- It was estimated that less than 2% contamination was received in the rollout carts. - For comparison, 30% of the blue bag recyclables were deemed unacceptable for end markets.
Applicability to North/South, Urban/Rural	The use of rollout carts for household organics are potentially applicable anywhere in Ontario. However, the most likely applications are in the urban/suburban communities in southern Ontario.
Multi-Unit Applicability	Applicable to low-rise buildings where regular waste and recyclables collection is carried out in the same manner as for single family dwellings (i.e., no dumpster or chutes are used).
Implications for Other Aspects of Waste Management System	Waste to incineration decreased by 30% through the organics and recyclables collection programs.

Financing and Economics

Capital Costs	The rollout carts were leased during the pilot project and have since been returned. Depending on the size of the container and order, rollout carts may cost between $65 and $100.
Operating Costs	Operating costs were not examined during the pilot project.
End Market Information	The compost was used onsite at the Whynott Settlement Solid Waste Site.

Performance

Material Quantities/ Capacity	- 23% (68 tonnes) of the residential waste stream was diverted through the implementation of the organics collection program (from September 2, 1992 to February 11, 1993). - It is estimated that another 5% was diverted through backyard composting. - An estimated 7% (21 tonnes) of the residential waste stream was diverted through the blue bag program (from September 2, 1992 to February 11, 1993).
Waste Diversion Impact	In total, approximately 30% of the residential waste stream was diverted through the pilot study.
Observed/ Measured Impact on 3R Awareness, Participation	- Many people who opted not to participate in the curbside collection program decided to backyard compost their materials instead. - From September to mid-November approximately one third of the householders set out their rollout cart biweekly. Another 24% set them out weekly. - In the winter, from mid-November to February, 18% set out their carts biweekly and another 18% set them out weekly.

Observed/ Measured Impact on 3R Awareness, Participation (Cont'd)

- More than one-half of the respondents to the survey indicated that they set their cart out at the curb less often in the winter months.
- Some freezing of material to the cart did occur. There was concern on how the freezing of organics to the cart in the winter would impact on participation rates. Project ended in February, before long term impact could be determined.
- Two in three felt that the collection system was preferable to the regular garbage collection.
- 85% rated the program excellent or good.
- When householders were asked "what was the worst aspect of the program", the following answers were provided:

- inconvenient to separate	34	7%
- smell	11	2%
- freezing	10	2%
- too many things to carry	1	<1%
- storage problems	11	2%
- washing cans and bottles	38	7%
- none	196	38%
- household education	6	1%
- other	73	14%
- Compostainer	15	3%
- mini in-house container	8	2%
- removing labels	16	3%
- size/maneuvering	42	8%
- hard to clean	9	2%
- no answer	46	9%

- In summary, the following six conclusions were presented to District Council:
  - "A wet/dry collection system will effectively divert waste from disposal.
  - A wet/dry collection system will be accepted by the residents of the municipalities.
  - Organic material in the carts will sometimes freeze in the winter and remain in the carts when the carts are dumped.
  - The fact that the material does sometimes freeze in the carts is not seen as a major concern by those who used the carts in the pilot project.
  - The wet/dry collection system tested, using the Compostainer, did not create a significant odour problem during the test period, even in rural areas where the participants received collection every second week.
  - The organic waste stream collected in this system had few visible contaminants, indicating that the system tested and the accompanying promotional material resulted in householders separating organics effectively from the rest of the waste stream."

Observed/ Measured Impact on 3R Awareness, Participation (Cont'd)

- Based on the results of the Pilot Project, the District modified its Solid Waste Management Strategy to include three stream collection.
- The District is currently examining the costs and other implications of implementing a District-wide composting and recycling program. The District is currently in the tendering process for a materials recovery facility and a composting facility.
- In the interim, curbside collection activities have returned to a basic one stream, garbage collection system with all materials sent to the incinerator.

Labour Requirements

Two people were required to operate the collection vehicle for the cart based system.

Design and Siting Requirements/Issues

Stakeholder Roles

The public was consulted throughout the pilot project. Most importantly, they were contacted at the beginning of the project to determine their attitudes and interest in participating in the pilot project. Techniques included surveys, telephone calls and information sessions.

Regulatory and Operating Environment

Government Regulations/ Standards

The use of any curbside collection container must conform with local bylaws.

Contacts

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Research References

Literature Sources

Wet/Dry Recycling Pilot Project, prepared for the Municipality of the District of Lunenberg (Nova Scotia) and the Towns of Bridgewater, Lunenberg and Mahone Bay, prepared by LURA Group, August, 1993.

Promotional materials supplied by District staff.

Personal Communications

Ray Halsey, P.Eng.
Fred Wendt
Paul Speed

7.0 ORGANICS

7.3 Drop-off (Depots) and Collection Approaches

7.3.1 Yard Waste Depots

General Overview

Household organics generated within a municipality are typically collected in one of two ways. A curbside collection service can be offered or drop-off sites can be provided where residents and commercial yard waste generators can deliver their material.

The selection of an appropriate level and type of collection service or location of drop-off depots will be specific to each community (in some communities both program are offered). A case study examining the use of drop-off depots, in combination with other "non-collection" yard waste options, is found in this profile.

Case Study / Subject Jurisdiction:

State College Borough, Pennsylvania (United States)

Demographics

Community Type:	Urban
Population:	38,000 (includes 24,500 Penn State students)
Households:	10,000
Population Served:	38,000
Households Served:	10,000

Driving Forces

- Town staff did not believe that the majority of residents would adopt grasscycling. Therefore, some other service would be required.
- Borough decided to offer an alternative without making it too convenient, which would discourage grasscycling, or making it too expensive.

Detailed Description

Specific Features

- The program started in 1991.
- It runs from early April to mid-October.
- Each of the five depots is a 6' x 6' (1.8m x 1.8m) permanent enclosure.
- There are five drop-offs located in city parks.
- Signage encourages residents to drop off only loose grass clippings (i.e., no bags).

Specific Features (Cont'd)	- City Public Works employees collect the grass each weekday using one two-man vacuum truck. - Vacuum truck can manage one day's grass with one trip to the compost site. - On holiday weekends, a collection run is done on Sundays. - Leaves are picked up curbside using a vacuum truck.
Waste Types and Sources	- Grass only is collected. - Other yard waste types are being considered (e.g., brush, leaves, etc.)
Operational Responsibility	The grass is picked up by the City's Public Works Department.
Role/ Requirements of Resident, Private/ Public Sectors	- Residents are asked to drop their grass off at one of the five sites. - Borough Sanitation Division is responsible for picking up the grass and operating the composting site.
Public Education/ Promotion/ Training	- Two packets of information explaining the basics of the composting program and the values of waste reduction were mailed to each household prior to the start of the program. There has been no follow-up since. - Literature also explained the benefits of grasscycling ("let grass lay" on the lawn) and the benefits of backyard composting (for those who did not want to grasscycle).
Material Flow/ Handling Methods	- Residents take their grass to one of five depots. - Public Works picks up the grass daily using a vacuum truck. - Grass is mixed with leaf windrows at a ratio of one part of grass to three parts leaves using a Wildcat windrow turner mounted on the front of the Department's front end loader.
Residue Management	Only a few plastic bags turn up at the drop-off depots.
Key Issues in Municipal/ Resident Acceptance	- Pesticide residues in grass trimmings a concern. - May start composting wood chips instead of using them as mulch to prevent spread of tree diseases.
Applicability to North/South, Urban/Rural	- May be applied to any type of community. - The size of the community, budget and the desired level of waste diversion will determine the appropriate number of drop-off locations.
Multi-Unit Applicability	Material collected from commercial landscapers can be delivered to depots.
Implications for Other Aspects of Waste Management System	Borough waste collection crews report that little or no grass is being collected with regular refuse.

Financing and Economics

Capital Costs	- Drop-off site construction $CND 520 each. - Composting site had a one-time capital cost of $CND 18,500.
Operating Costs	Labour costs are estimated at $CND 36,800 (1991).
Administrative Costs	Information requested but not provided or available.

Revenues	None received. Material is used internally or given away.
End Market Information	- Finished product is utilized by the Borough for flower beds and tree planting. - Finished compost is placed at the drop-off depots for public pickup (quantities unknown).

Performance

Material Quantities/ Capacity	An average of 6.5 cubic metres of grass was collected each day from the five drop-offs.
Overall Unit Cost	Capital and operating costs average $CND 1.10 per capita.
Unit Operating Costs	Information requested but not provided or available.
Waste Diversion Impact	Information requested but not provided or available.
Observed/ Measured Impact on 3R Awareness, Participation	A total of 730 cubic metres of grass clippings (an estimated 210 tonnes) were diverted to the composting facility from mid-May to mid-October, 1991.
Labour Requirements	- Two Public Works employees spend approximately four hours each day from early April to mid-October collecting the grass clippings from the drop-off areas. - Two additional Public Works employees spend approximately two hours, three days each week from early April to mid-December at the composting site forming and turning the windrows. - No turning occurs between mid-December and April. - For two full workdays every other month from April to December, eight to ten Public Works employees screen the finished compost to remove lumps and foreign matter and transport the finished compost to the Works garage for future use.

Design and Siting Requirements/Issues

Stakeholder Roles	Information requested but not provided or available.
Approvals Process, Timing Costs	Information requested but not provided or available.
Conditions of Approval	Windrows were formed and turned and grass incorporated in a manner consistent with the Pennsylvania Department of Environmental Resources' guidelines.
Reporting Requirements	Because they are not selling the compost, there are no reporting requirements.

Regulatory and Operating Environment

Government Regulations/ Standards	Windrows were formed and turned and grass incorporated in a manner consistent with the Pennsylvania Department of Environmental Resources' guidelines.
Industry Standards	Information requested but not provided or available.

Contacts

Governmental	Mark Whitfield Department of Public Works State College, Pennsylvania (814-234-7140) Lee Lowry Director, Sanitation Division of State College's Department of Public Works State College, Pennsylvania (814-234-7140)

Research References

Literature Sources	Schlauder, R.M. and L.L. Lowry, "Multioptions for Grass Diversion", Biocycle, March 1992, pp. 72-74.
Personal Communications	Mark Whitfield Lee Lowry Alan Sam, Arborist, Pennsylvania Turf and Grass Council, Bellefonte, PA (814) 355-8010.

7.0 ORGANICS

7.4 Anaerobic Digestion

7.4.1 Anaerobic Digestion - Profile # 1

General Overview

There has been an increasing recognition of the benefits of composting organic wastes. In addition to the potential for diverting a larger portion of the waste stream, composting produces a useful soil conditioner which conserves the valuable nutrients found in the organic wastes. Most composting facilities in Ontario have focused on the use of large open, aerobic (i.e. decomposition in the presence of oxygen) systems. This case study presents anaerobic digestion (i.e. decomposition in the absence of oxygen) as an alternative to this approach.

Case Study / Subject Jurisdiction:

Brecht, Belgium

Demographics

Community Type:	Rural
Population Served:	50,000
Households Served:	26,000

- High density rural, on average 500 people per km^2 - what would be considered suburban in Ontario.
- Facility serves a number of the member municipalities of the Inter-municipal Regional Authority.
- Inter-municipal Regional Authority represents 20 rural municipalities surrounding Antwerp.

Political/ Social Factors

- Source separation of organic wastes and non-recyclable (spoiled) paper is mandatory.
- Waste diversion is top priority for the Regional Authority.
- 50% of the European waste stream is organic material and non-recyclable paper (compared to 30-40% for North America).
- Quality control requirements for finished compost are becoming increasingly stringent
- Results of pilot project good.

Driving Forces

- Strong public opposition to landfilling.
- Limited space available for landfilling.
- Siting of landfill approved only upon demonstration of effective waste diversion initiatives.

Detailed Description

- Facility uses DRANCO (DRy ANaerobic COmposting) process to treat organic wastes.
- Process characterized by:
  - High total solids content of input biowaste (35 - 40%).
  - Thermophilic operating temperature of digester (50 - 55 C).
  - High loading rates.
  - Short retention times.
  - High production rates and conversion efficiencies due to high solids content.
  - Stationary reactor.
- Non-recyclable paper collected with the organics corrects the carbon to nitrogen (C:N) ratio of the biowaste.
- Odour problems in the home resulting from collection of material are minimized with more optimal C:N ratio.
- Higher C:N ratio improves biodegredation.
- Excess moisture from organic wastes minimized through absorbtion by the paper fraction.

Specific Features

- Facility located adjacent to a landfill; shares weigh scales and waste water treatment facility.
- Tipping area is enclosed and vented.
- Negative air pressure system redirects vented air to aerobic composting area.
- Material is comminuted (reduced to small fragments) in rotating drum and sieved using a 40 mm screen.
- Oversized waste (roughly 20% of incoming material) is landfilled.
- Sieved material consists of plastic from diapers and pieces of yard waste.
- Fragmented waste is seeded with digested residue, steam heated to 50°C and pumped, into the digester.
- Residency time in the digester - 10 to 15 days.
- Digester dimensions - 7m diameter, 21 m high with a volume of 808 m^3.
- Digested residue is dewatered, using a screw press, to 50-55% solids.
- Press liquor is treated as waste water - final discharge unknown.
- Residue is refined using vibrating sieve and treated aerobically for 10 days.
- For each tonne of incoming biowaste produces roughly 350 kg of finished material, 130 kg of biogas, 370 kg of wastewater and 200 kg of sieved material.
- Finished material, Humotex, sold as high quality soil amendment.

Specific Features (Cont'd)	- 8% of biogas used to produce steam used in process, heating through winter months. - Remaining biogas used to produce electricity, used in facility and sold to power grid. - Electricity generation during day time and peak hours when sale is most profitable. - Facility is energy self-sufficient. - Excess biogas flared. - Conveyor belts used to transport material from tipping floor through rotating drum, sieve and dosing unit to pump. - Piston pump conveys dosed waste to digester. - Total plant footprint occupies 2,300 m^2, facility occupies 800 m^2. - Biogas captured and stored in gas bags.
Waste Types and Sources	- Wet organic wastes including food waste, vegetable and fruit waste and garden waste and other putrescible material. - Difficult to recycle paper including disposable diapers, tissue paper, office paper, wrapping paper, food contaminated paper, etc.
Operational Responsibility	- Facility operated by Organic Waste Systems (OWS). - Facility is privately owned by Laidlaw Brecht (51%) and Organic Waste Systems (OWS) (49%).
Contractual Arrangements	The Regional Authority must supply the facility with a minimum of 8,000 tonnes of organic waste annually for next 7 years (8 year contract started in 1992).
Role/ Requirements of Resident, Private/ Public Sectors	- Regional Authority provided 57 L plastic containers to residents for sorting organic and non-recyclable paper waste. - Source separation of organic material and non-recyclable paper is mandatory; enforcement methods unknown. - Private sector responsible for treatment of waste, sale of end products and management of residues.
Material Flow/ Handling Methods	- Organic material and non-recyclable paper source separated and placed into specialized plastic containers. - Waste collected at curbside and transported to facility. - Material is dumped onto a tipping floor and bulldozed onto push floor which feeds the material onto a conveyor system. - Residues are disposed of at adjacent landfill.
Residue Management	Material sieved from incoming waste and digested residue is landfilled.
Key Issues in Municipal/ Resident Acceptance	- Odour control - nearest residence located within 200 ft (60 m) of facility. - Public and Region need to be satisfied that efforts to source separate are not wasted i.e. that all putrescible wastes received by facility are treated.

Implications for Other Aspects of Waste Management System	- Mandatory source separation of organic material and non-recyclable paper. - Regional Authority implemented curbside containerized collection of putrescible material.

Financing and Economics

Capital Costs	- $CND 5.08M in 1992 for Brecht facility exclusive of weigh scales and wastewater treatment facility. - Avoided cost of approximately $CND 2.54M due to sharing of existing scale and treatment facilities at landfill. - Amortization period - 7 years.
Operating Costs	Break even at $CND 95/tonne based on processing of 10,500 tonnes/year.
Administrative Costs	Information requested but not provided or available..
Revenues	- From sale of Humotex - $CND 12.7/tonne. - From sale of electricity - $CND 0.25/kWh during peak periods.
End Market Information	- Electricity sold to power grid. - Finished material, Humotex, sold directly to horticulture and other interested companies for use as soil amendment.
Financing Arrangements/ Issues	- One time EEC subsidy of $CND 635,700 - $CND 762,900 for development of alternative (renewable) energy production facility. - Belgium Government - $CND 1.27M interest free loan over 3 years. - Laidlaw - $CND 3.18M loan.
Contractual Arrangements	- OWS contracted to operate the facility for 8 year period starting 1992. - Regional Authority to assume ownership of facility following completion of contract. - Tip fee at facility - $CND 95/tonne.
Setting/ Adjusting Rates	Guaranteed maximum tip fee of $CND 95/tonne during 8 year contract taking into consideration increases due to indexation.

Performance

Material Quantities/ Capacity	Current operating capacity 43 - 50 tonnes/day or 12,000 to 14,000 tonnes/year.
Overall Unit Cost	Information requested but not provided or available.
Unit Capital Costs	Information requested but not provided or available.
Unit Operating Costs	Information requested but not provided or available.
Energy Consumption	- Facility is energy self-sufficient. - Biogas is used to produce steam for process and electricity to meet facility's needs. - Excess electricity produced is sold to the power grid..

Durability/ Downtime	- All maintenance possible while the facility is in operation. - Downtime is minimal. - Downtime for conveyor belts moving incoming waste occurs between arrival of collection trucks. - Digester can be serviced without interrupting operation. - Difficult to assess average downtime expected as facility only in operation for 1 year.
Waste Diversion Impact	Some participating municipalities claiming 35 - 40 % diversion of wastes.
Observed/ Measured Impact on 3R Awareness, Participation	- Mandatory source separation and collection of putrescible material implemented only one month before plant became operational. - Quality and quantity of material received has been good.
Labour Requirements	- 1 Director of operations. - 4 to 5 staff, 2 staff per 12 hour shift, 2 shifts per day. - Require some knowledge of mechanical and electrical systems as staff are responsible for routine maintenance of the facility.
Labour Skills Required	- Staff personnel - low - some knowledge of mechanical and electrical systems required as staff will be servicing and maintaining facility. - Facility Director - high - engineering background and certification.
Net Employment Impact	- Total facility staff requirements - 6. - Employment impact due to implementation of curbside organics collection program unknown.
Employee Health & Safety Issues	- Worker contact with waste is limited to front end of process. - No specific heath and safety issues raised through operation of facility.

Design and Siting Requirements/Issues

Stakeholder Roles

OWS:
- Operation of facility.

Laidlaw:
- Funding of project.

EEC:
- Provided funding; supervises activities of facility.

Stakeholder Roles (Cont'd)	Flemish Public Waste Authority: - Finished material quality control monitoring. Flemish Public Water authority: - Quality control monitoring of wastewater treatment effluent. Belgium Government: - Provided funding. Inter Municipality Regional Authority: - Enforces mandatory source separation of putrescible material. - Ensures minimum tonnage requirements of contract are fulfilled. Public: - Source separation of putrescible material.
Approvals Process, Timing Costs	Length of approval process - 1 year.
Environmental Issues	- Finished material must meet quality standards. - Press liquor from process must be treated. - Odour control mechanisms must be in place.
Conditions of Approval	Grace period of 1 year granted for use of mixed waste before having to use biowaste exclusively.
Reporting Requirements	Open book accounting to Regional Authority.

Regulatory and Operating Environment

Government Regulations/ Standards	Finished material must meet quality standards.

Contacts

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Private Sector

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Research References

Literature Sources

Experiences on the Recycling of Municipal Solid Waste to Energy and Compost, De Wilde, B., De Beare, L., Organic Waste Systems, Dok Noord 7B, B-9000 Gent, Belgium

Methanization of Biowaste in the Full-scale DRANCO Plan in Brecht, Belgium, an EEC Supported Project, Boelens, J., De Beare, L., Six, W., Organic Waste Systems, Gent Belgium

Personal Communications

Luc de Beare, OWS
Hector Franco, Laidlaw

7.0 ORGANICS

7.5 Aerobic Composting

7.5.1 Leaf and Yard Waste Composting

General Overview

Composting can be accomplished using a wide variety of technologies and/or management techniques. Generally, the key to a successful composting operation is the development and maintenance of an optimum environment for microbial degradation. In addition, sufficient pre-processing must occur to ensure that a high quality feedstock enters the composting process. The degree of post processing required is based primarily on the designated end use for the compost product. This case study presents a composting system which processes yard waste. The composting system is comprised of three phases: material preparation, decomposition and finishing.

Case Study / Subject Jurisdiction:

Islip, New York (United States)

Demographics

Community Type:	Urban	Land Area:	27,500 hectares
Population:	306,000	Population Served:	244,800
Households:	111,300	Households Served:	77,000
Total Residential Waste:		122,400	
Total Commercial Waste:		227,600	

Driving Forces

Waste diversion from disposal facilities.

Detailed Description

The Town of Islip, New York (located on Long Island) has been operating a yard waste composting facility since September of 1988. The composting facility is located within the Town's borders on a 16 hectare parcel. The parcel is located along the northern perimeter of the MacArthur Airport Complex in Ronkonkoma, New York.

Specific Features

- The composting site began operation in September, 1988.
- The site was designed and approved to accept up to 55,000 tonnes of residential and commercially generated yard waste annually from the Town of Islip.
- Ten of the 16 hectares of the site are designated for active composting (windrows).
- The facility operates two shifts per day during the spring and summer and one shift per day in the fall and winter.
- The nearest resident is located 244 m from the compost facility.

Waste Types and Sources

- The facility currently processes 36,000 tonnes/year of yard waste comprised of about 50% grass with the remaining yard waste consisting of leaves and wood debris.
- Feedstock is collected from town residents (mainly single family units), municipal agencies and commercial landscapers.
- Yard waste is collected in the spring and fall in clear plastic bags from households using regular garbage collection vehicles (rear packer).
- The duration of the collection period varies with the type of yard waste season (e.g., the amount of material being collected) being experienced. A typical four week period in the spring followed by a four to six week period in the fall.
- Shredded wood for bulking agent is received at no cost from a variety of outside sources.

Operational Responsibility

The facility is owned and operated by the Town.

Contractual Arrangements

- Seasonal mailings are sent to residents to inform them what days of the week will be designated for leaf collection.
- Seasonal messages also serve as a promotional tool conveying other waste management information.

Material Flow/ Handling Methods

Preprocessing (material preparation phase)

- Mixed yard waste is moved to the receiving area using a front end loader.
- The yard waste passes through a low speed shredder/debagger capable of processing 23 tonnes/hour.
- The shredded material is conveyed to a trommel screen (80 mm aperture size).
- The trommel screen mixes and aerates the yard waste as well as removes oversized material.
- The processed material is automatically transferred by conveyors to temporary storage piles or directly into dump trucks and taken to the windrowing area.
- The preparation phase removes about 70% of the plastic contamination in the feedstock.
- If necessary, water is added to obtain an initial moisture content of about 50 per cent.

Composting process (decomposition phase)

- Size of the windrows depends on the time of year and the predominant type of waste being received.
- Windrows composed of leaves may be formed at a maximum height and width of 3.7 m and 7.9 m respectively.
- Windrows composed of grass will vary in size depending on the amount and type of bulking agent used with a maximum height and width of 1.8 m and 4.3 m respectively.
- All windrows are formed on a wood chip base.

Material Flow/ Handling Methods (Cont'd)	- The wood chip base absorbs leachate, eliminates the layer of compacted organic material often left by the turning machine, increases porosity and improves drainage at the bottom of the pile. - Smaller windrows are turned with a rotary drum turning machine. - Larger windrows are turned with a front end loader. - Controlling the decomposition rate by varying windrow size and turning frequency allows the turnover rate of the material in the windrows to be regulated. - The time required to compost grass ranges from six to eight weeks depending on the windrow size, composition and turning regime used. - The time required to compost leaves is generally 16 weeks. - Following active windrowing, the piles are cured for four to six weeks. Post-processing (finishing phase) - The compost is screened to remove the wood chips and plastic from the compost. - The wood chip/plastic mixture is passed through an air classifier to separate out the plastic from the wood chips so they can be reused.
Residue Management	Plastic and other materials comprise about 5% of the incoming feedstock and are typically landfilled as quantities are insufficient to justify further management.
Key Issues in Municipal/ Resident Acceptance	The facility has experienced odour complaints from nearby residents in the past mainly due to the odours associated with composting grass, however, due to a change in management techniques (e.g., the more frequent addition of bulking agents such as leaves or shredded wood) the number of odour complaints have been reduced.
Applicability to North/South, Urban/Rural	Yes, but the favourable economics of this facility are based on a large population/service area.
Multi-Unit Applicability	Material collected from commercial landscapers that provide landscape management services to multi-unit buildings is delivered to the facility.
Implications for Other Aspects of Waste Management System	A significant quantity of waste no longer requires landfilling (up to 10% by weight), particularly during the summer (grass season).

Financing and Economics

Capital Costs	- $CND 1,800,000 was spent on processing equipment in 1988. - $CND 1,200,000 was spent on site preparation in 1988.
Operating Costs	The facility operating cost was $CND 900,000 in 1992.
Administrative Costs	Information requested but not provided or available.
Revenues	- The finished compost is available to the town residents free of charge. - Commercial enterprises pay $4.50 per cubic metre for good quality, screened compost.

End Market Information	- Users of compost include landscape contractors, turf growers, topsoil suppliers and nurseries.

Performance

Material Quantities/ Capacity	- The facility is capable of processing approximately 36,000 tonnes/year of yard waste. This results in the production of about 30,500 - 46,000 cubic metres of compost or 15,300 - 23,000 tonnes per year of compost assuming a density of 500 kg/cubic metre for the compost product. - The design capacity is 55,000/tonnes per year.
Overall Unit Cost	Information requested but not provided or available.
Unit Capital Costs	Information requested but not provided or available.
Unit Operating Costs	$CND 25/tonne of yard waste processed.
Waste Diversion Impact	10% of the total waste stream.
Observed/ Measured Impact on 3R Awareness, Participation	Information requested but not provided or available.
Labour Requirements	The facility employs 20 labourers.

Design and Siting Requirements/Issues

Stakeholder Roles	Town is responsible for: - all residential waste management activities including the collection and delivery of seasonal yard waste. - composting all yard waste delivered to the site.
Approvals Process, Timing Costs	Information requested but not provided or available.
Conditions of Approval	Information requested but not provided or available.

Reporting Requirements	- The Town submits an annual report on the CCF operations as per the requirements of State legislation which must include:
	  - the type and quantity of yard waste received at the facility;
	  - the turning frequency (if applicable);
	  - the amount of water added;
	  - the quantity of compost produced;
	  the quantity of compost removed from the site; and
	  - a description of the end-markets and applications.

Regulatory and Operating Environment

Government Regulations/ Standards

Yard waste composting facilities are regulated by the New York State (NYS) Department of Environmental Conservation (DEC) under 6 NYCRR Part 360 Solid Waste Management Facilities, effective December 31, 1988. Yard waste is defined, under Part 360 as "leaves, grass clippings, garden debris, and small or chipped branches."

Industry Standards

If compost product is to be mixed with other material and sold as a fertilizer, then the product for sale must guarantee the advertised nutrient analysis and be registered with the New York State Department of Agriculture and Markets.

Contacts

Governmental

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Research References

Literature Sources

Richard, Thomas; Dickson, Nancy; and Rowland Sally. Yard Waste Management. New York State Department of Environmental Conservation, 1991.

Buckner, Stuart, C. "High Volume Yard Waste Composting". BioCycle. April 1991.

Personal Communications

Stuart Buckner, Director of Environmental Services
Peter Daly, Recycling Coordinator

7.0 ORGANICS

7.5 Aerobic Composting

7.5.2 Centralized Composting

General Overview

Composting can be accomplished using a wide variety of technologies and/or management techniques. Generally, the key to a successful composting operation is the development and maintenance of an optimum environment for microbial degradation. In addition, sufficient pre-processing must occur to ensure that a high quality feedstock enters the composting process. The degree of post-processing required is based primarily on the designated end use for the compost product. This case study presents the International Process System (IPS) Agitated Multi-Bay Composting System for processing several types of organic wastes. The composting system is comprised of three phases: pre-processing, processing and post-processing.

Case Study / Subject Jurisdiction:

Fairfield, Connecticut (United States)

Demographics

Community Type:	Urban
Population:	50,000
Households:	19,000
Population Served:	40,000
Households Served:	13,000
Total Residential Waste:	24,500 tonnes
Total Commercial Waste:	16,300 tonnes

Driving Forces

- Waste diversion from disposal facilities.
- State ban on leaf disposal in landfills and incinerators.
- Town landfill is closing and it is planned for use as a park. As a result, the current pre-processing of leaves at the landfill would move to Fairfield facility (across the street) and all the Town's composting activities would take place at one location.
- The compost produced could be used for landfill rehabilitation.

Detailed Description

The Town of Fairfield, Connecticut has been operating a 36 wet tonne per day (wtpd) sewage sludge and yard waste composting facility since August 1989. The composting facility is located at the Town of Fairfield Wastewater Treatment Plant (WTP) at One Rod Highway, Fairfield CT. It is located on a 2 acre parcel of land. Yard waste pre-processing (i.e., shredding) is performed at the landfill located across the street from the composting facility.

Material Flow/ Handling Methods - The following three stages identify the major processes at the facility. Organic materials collected as part of the pilot project were kept in a separate bay at the facility.

Ongoing Program - Pre-processing

- The sewage sludge is dewatered to 20-22% solids in a filter press at the Fairfield WTP.
- The yard waste is shredded using two tub grinders located at the yard waste processing facility. Periodically, Fairfield will rent a stump grinder to process stumps, trees and clean wood waste too large for the tub grinders.
- The wood chips from the stump grinder and the brush from the yard waste collection are processed twice with the first tub grinder using a 102 mm screen and the second tub grinder using a 25 mm screen. The production of bulking agent with a particle size of 25 mm eliminates the need for final screening of the finished compost.
- Leaves are processed using only one of the tub grinders with the other available as a standby unit.
- A mixer truck, located at the composting facility is used to mix a specified mixture of yard waste and sewage sludge. If the mixing truck requires repairs, the material is mixed on the tipping floor with a front-end loader.
- The feedstock is prepared to have a solids content of 40%. When shredded brush is used as the bulking agent a 1:1 ratio of sewage sludge to shredded brush is used. When shredded leaves are used for bulking, ratios ranging from 2:1 to 1:1 leaves to sludge are used.

Ongoing Program - Composting Process

- Facility consist of six bays (troughs) each 67 m long and 1.8 m wide.
- The feedstock is placed into the bays using a front-end loader to a depth of 1.5 m.
- The bays are agitated using two automated mechanical agitators. The agitator is sent through the compost five times per week.
- The agitator machine starts at the back of the bay and removes the finished compost. It then moves toward the front of the bay, mixing, agitating and moving the material 3.7 m down the bay everyday. This creates space for a new load of feedstock.
- Each bay has five aeration zones and each aeration zone has a blower and a thermocouple in the wall of the bay. The blower draws air from inside the building and blows air through the bottom of the bay.
- The sludge-yard waste mixture has a residence time of three weeks in the bays.

Material Flow/ Handling Methods (Cont'd)

- Following the 3-week residence time the compost may leave the site. Area is available for the compost to be stored at the facility, if required.
- Water addition can be achieved through a mister attached to the mechanical agitators. Water is not required for the compost process either before or during the composting process. However, water is often added to reduce dust and particulate levels.
- Six ventilation blowers exhaust air, dust and moisture either to the outside atmosphere or to a biofilter for odour control. The decision to release exhaust to the atmosphere depends on many factors, including climatic conditions.
- The biofilter is 520 cubic metres and is constructed of one part leaf and yard waste compost, one part soil mixture and one part bark mulch. The bark mulch is placed over the top of the biofilter and is used to prevent weed growth on the surface of the biofilter. The bark mulch cover also helps to protect the biofilter from the elements (e.g., sun).
- In order to maintain sufficient moisture in the biofilter to sustain the microbial populations, exhaust air from two of the six blowers is continually recirculated through the biofilter.

Ongoing Program - Post-processing

- Currently, there is no post-processing.
- The facility is considering implementing final screening to increase the value of the compost product.

Pilot Project

- The compostable "wet bag" materials were collected every week, weighed and taken to the Fairfield composting facility where they were combined with yard waste and composted in one of the bays. - For food waste, the residence time in the in-vessel system was increased from three to four weeks. An outdoor curing period of two months was employed for food waste and the compost product was screened (using a 9.5 mm trommel screen supplied by Royer Industries) following the 39th day of the 60 day curing period.

Residue Management

Ongoing Program

- Contaminants (usually large rocks) comprise less than 1% of the incoming feedstock.

Pilot Project

- Contaminants (usually plastic film) comprised less than 4% of the incoming feedstock from households and the three restaurants.

Key Issues in Municipal/ Resident Acceptance	Ongoing Program - There have been no issues associated with the curbside collection of yard waste. - Odours complaints were experienced in the past because of a large pile of grass which was stockpiled for a period of two weeks. The stockpiling of grass is now avoided. - Noise complaints were experienced in the past due to the large uncovered ventilation blowers on the outside of the building. This problem was remedied by the replacement of the existing motors with quieter ones. Pilot Project - A telephone survey indicated that 77% of the participants would again sort their compostables if asked.
Applicability to North/South, Urban/Rural	- Given the enclosed nature of this facility it is relatively insensitive to climate changes. - Since this facility has odour control (i.e., a biofilter) it would be applicable to both an urban and rural environment.
Implications for Other Aspects of Waste Management System	Significant quantities of yard waste and sewage sludge no longer require landfilling and/or incinerating. The diversion potential would be further increased with the addition of household and/or restaurant organics.

Financing and Economics

Capital Costs	The total project cost for compost facility, yard waste shredding equipment, dewatering press and biofiltration odour control was $CND 3,800,000 (1989).
Operating Costs	Total operating costs range from $CND 200,000 to $300,000 per year.
Administrative Costs	Information requested but not provided or available.
Revenues	- The finished compost is available to the town and its residents free of charge. - The town charges $CND 55 per tonne to take unchipped wood or brush, however, it does not charge for chipped brush or leaves. - A savings of $CND 300,000 per year in tipping fees to the landfill is achieved. - A savings of $CND 520,000 per year in incineration fees for disposing of sewage sludge is achieved. - Eliminates the need for the town to buy screened topsoil at a cost of $CND 30-40/tonne.
End Market Information	- The town uses the compost for municipal construction, reclamation projects and as landfill cover. - Residents use the compost for private home use.

Performance

Material Quantities/ Capacity

The facility is capable of processing between 9,000 and 11,000 tonnes per year of sewage sludge and yard waste. This results in the production of about 13,000 cubic metres of acceptable quality compost or 6,500 tonnes per year of compost (assuming a density of 500 kg/cubic metre for the compost product).

Waste Diversion Impact

Ongoing Program
Approximately 8% of the total waste stream is diverted from disposal facilities (3,300 tonnes of yard waste of 40,800 total tonnes). The diversion estimate does not include the composted total sewage sludge as this is not considered part of the solid waste stream.

Pilot Project
Analysis of the weights of compostables, recyclables and "other" bins collected from the homes revealed that 40% of the materials generated by the participants waste were recycled, 30% were composted and 30% were sent for final disposal. It is of note that, due to the timing of this study, no yard waste was collected or processed from participating households.

Observed/ Measured Impact on 3R Awareness, Participation

Ongoing Program
Information requested but not provided or available.

Pilot Project
- 225 calls were received from householders of which only 7 were negative:
  - "The project is too much of an effort."
  - "The project is confusing and difficult to understand."
- The other 218 were a mixture of positive statements regarding the project, questions regarding collection days and clarification of what materials are compostable.
- a 75% participation rate (defined as participating every week) was achieved from those households that agreed to participate.

Labour Requirements

The labour required to run a six-bay facility includes about 2,100 supervisor hours and about 8,300 general labourer hours annually.

Design and Siting Requirements/Issues

Stakeholder Roles

The composting facility was built as a turnkey operation with IPS supplying the engineering equipment and services under contract with the town. The final design engineering was subcontracted to Fuss and O'Neill Consulting Engineers of Manchester, CT.

Approvals Process, Timing Costs

Given the location of the composting facility on the site of the WTP, the approvals were completed within a 45-day time period.

Environmental Issues

Information requested but not provided or available.

Conditions of Approval	Information requested but not provided or available.
Reporting Requirements	Information requested but not provided or available.

Regulatory and Operating Environment

Government Regulations/ Standards	- As of 1990 Connecticut had a state wide "source reduction" law. This law set limits to the amount of toxins in packaging and banned the sale of products that exceeded those limits. - In 1990, Connecticut implemented a state wide "source separation" law that required that nine items be 100% recyclable by January 1, 1991. The mandatory recyclables include: leaves, cardboard, metal food containers, glass food containers, scrap metal, storage batteries, newspaper, office paper and waste oil. - The state set a recycling goal of 25% by 1991. It is of note that sewage sludge is considered a "special" waste and the tonnages of sludge diverted from final disposal are not included as part of the 25% goal. - The State of Connecticut has placed a disposal ban on lead-acid batteries, nickel-cadmium batteries, used oil and leaves.
Industry Standards	The compost produced at this facility meets all standards set by the Federal Regulation 503 which includes a biological test of the final compost. In addition, the compost is termed "exceptional compost" according to federal regulations.

Contacts

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Personal Communications

Wallace MacKinnon
Don King

Section 8

Household Hazardous Waste

8.0 Household Hazardous Waste

8.1 Return to Point of Sale

8.1.1 Return to Point of Sale - Profile # 1

General Overview

Although household hazardous wastes (HHW) make up only a small portion of the residential waste stream, the toxicity of the wastes, and their disposal, have warranted increased attention. One of the difficulties in collecting and managing HHW is that it is not often thought of as hazardous, in terms of disposal requirements, by the generator. Alternatives to HHW collection days, which have proven to be both expensive and relatively ineffective, have been considered in both the U.S. and in Europe. This case study examines a return-to-vendor program tested in Germany.

Case Study / Subject Jurisdiction:

Region of Freisland, Germany

Demographics

Community Type: not avail.
Population: 95,622
Population Served: Information requested but not provided or available.

Political/ Social Factors

- Pilot program undertaken in 1985 to study various methods of recovering HHW.
- Several collections methods tested simultaneously in order to provide basis for comparison.

Driving Forces

- Staff already have training necessary to handle HHW.
- Return to vendor provides residents with more than one location for drop off of HHW.
- Convenient hours (open until 6 pm.).
- Provides individuals with a convenient method of handling their HHW.
- Helps to facilitate the movement of HHW to proper disposal facilities.

Detailed Description

- Of 500 stores contacted, 115 participated in program.

Specific Features	- Pilot project operating since 1985. - Gas stations and auto shops accepted used oil, oil containing substances and car batteries. - Oil and batteries stored in 600 L plastic tubs with lids, tubs could be stored on pallets. - Oil containing substances stored in 240 L containers with coloured lids. - Paint vendors accepted paints and solvents. - Paints and solvents stored separately in 185 L plastic tubs with lids. - Drugstores accepted old medications and broken thermometers. - Medications stored in bags and 60 L plastic containers with lids. - Broken thermometers stored in 1 L plastic bottle with screw on cap. - Nurseries and agriculture based stores accepted fertilizers and herbicides. - Fertilizers and herbicides stored in 220 L, 120 L or 60 L plastic barrels with ring closures. - Supermarkets accepted household chemicals (presumably cleaners) and batteries. - Household chemicals stored in 185 L plastic tubs with lids. - Household batteries stored in 60 L plastic containers with lids. - Fluorescent light tubes stored in cages (1.5m x 1m x 0.8m) on wheels (collection point unknown).
Waste Types and Sources	Used oil and oil containing substances, auto and household batteries, paints, solvents, pharmaceuticals, broken thermometers (presumably mercury based), fertilizers, herbicides, household chemicals and fluorescent lighting tubes.
Operational Responsibility	Operated by public sector in cooperation with stores.
Role/ Requirements of Resident, Private/ Public Sectors	- Individuals are responsible for sorting bringing the wastes to the collection point. - Vendor or store keeper receives and stores material in designated containers. - When containers are full, store owner phones for pick-up of container. - Role of hauler unknown. - Municipal garbage taxes used to cover cost of program. - Municipal government responsible for contacting stores, advertising program.
Public Education/ Promotion/ Training	- Press conference used to launch program. - Window stickers used to identify participating stores. - Educational brochures distributed to all households describing types of materials accepted and location of participating stores.
Material Flow/ Handling Methods	Information requested but not provided or available.
Residue Management	Information requested but not provided or available.
Key Issues in Municipal/ Resident Acceptance	Convenience.

Financing and Economics

Capital Costs	Information requested but not provided or available.
Operating Costs	Information requested but not provided or available.
Administrative Costs	Information requested but not provided or available.
Financing Arrangements/ Issues	Information requested but not provided or available.
Contractual Arrangements	Information requested but not provided or available.

Performance

Overall Unit Cost	Information requested but not provided or available.
Waste Diversion Impact	Material quantities collected between January and October 1985: - Oil - 5,250 Kg - Car batteries - 5,874 pieces - Oil containing substances - 4,419 kg - Paints - 12,377 kg - Solvents - 2,121 kg - Household chemicals - 1,269 items - Pharmaceuticals - 3,014 kg - Thermometers - 9 pieces - Fluorescent light tubes - 1,231 kg - Household batteries - 2,437 kg - Fertilizers and herbicides - 433.5 kg - Total - 38.5 tonnes.
Observed/ Measured Impact on 3R Awareness, Participation	Of the total number of people participating in the 4 collection methods tested concurrently, 71.5% used the return to vendor program.
Labour Requirements	Store employees already trained to handle the material.
Net Employment Impact	Information requested but not provided or available.
Employee Health & Safety Issues	Information requested but not provided or available.

Design and Siting Requirements/Issues

Stakeholder Roles	Information requested but not provided or available.
Environmental Issues	Information requested but not provided or available.
Conditions of Approval	Information requested but not provided or available.
Reporting Requirements	Information requested but not provided or available.

Regulatory and Operating Environment

Government Regulations/ Standards	Information requested but not provided or available.

Industry Standards	Information requested but not provided or available.

Contacts

Governmental	Ms. Neumann County of Freisland Tel: 04461 120

Research References

Literature Sources	Erfassung van schadstoffhaltigen Problem-Kleinmengen im Haushalt Bearbeiter: Dipl.Ing. (FH) Wolfgang Schafer
Personal Communications	Information gathered by ITU, GMBH, Berlin

Section 9

Other

9.0 OTHER

9.1 Collection Vehicle Design

9.1.1 Wet/Dry Collection Vehicle Design

General Overview

The implementation of waste diversion initiatives has led to the requirement to collect a range of separate materials streams at curbside:

- dry materials for recycling (e.g. containers and fibre)
- organic materials for composting (e.g. food and yard waste)
- residue for landfilling

In some communities this collection is accomplished with three separate vehicles passing the same residence. In other communities residents put out different materials in different coloured bags. All bags are collected with an existing packer truck. When the packer tips its load the bags are sorted manually and routed to the appropriate facility.

Industry is responding to the collection challenge with single vehicles designed to collect multiple material streams. Some vehicles have multiple bin compartments plus a compaction unit for the co-collection of several source separated dry materials plus organics or residue. Other units have two separate compaction units mounted on the same truck. Such a vehicle can be used for two stream wet dry collection where all solid waste is divided into two streams one wet and one dry. The dry stream containing recyclable materials plus residue, is delivered to a material recovery facility for sorting while the wet stream is composted.

These trucks, equipped with two separate compaction units can also be used in a 3 stream wet dry collection system (i.e. wet organics, dry recyclables, and residue). In such a system dry recyclables would continue to be collected in a multi-compartment recycling truck while the two compartment packer could be used for the co-collection of organics and residue.

This case study provides an overview of some of the major types of collection vehicles in the final prototype stage. Full production models are expected on the market in the near future (late '93, early '94).

Case Study / Subject Jurisdiction:

- **Oshkosh Truck Corp.**
  Oshkosh A-Series

- **Shu-Pak Refuse Equipment**
  Shu-Pak II

- **Pak Mor Manufacturing Co.**
  Pak Mor Load Liner II Series Dual Chamber Rear Loader

- **Haul All Equipment Systems**
  Haul All AP24, AP30

Driving Forces

Reduction in waste/material collection service cost.

Detailed Description

Co-collection Vehicle Design

Co-collection of community waste and recyclables is the simultaneous collection of both streams by one truck and collection crew. Alternatively collection programs using a two truck program for recyclables an waste may be more effective in specific cases. Major factors which influence the choice of collection methods in specific applications include: waste generation rates, household density, number and type of recyclables to be accepted and separation procedures required at truck-side or curb-side and location of material processing/disposal facilities.

The following list of trucks, though not complete, is representative of the types of vehicles developed for providing co-collection duty.

Specific Features

Oshkosh A-Series (see Figure 1)
Compacts refuse and collects recyclables. Trash is collected in a side loading refuse compactor, recyclables are collected in two separate side loading bins. Both trash and recyclables can be loaded from either side. Optional equipment includes a plastics compactor and single or dual cart dumpers.

Recycling Body
- Capacity: 12.2 m^3 (2 bins - 6.1 m^3 each).
- Hopper capacity: 681 L per side.
- Unloading: tilts to left side, dumps into roll off.

Side Loader Body
- Capacity: 13 m^3.
- Hopper capacity: 1 m^3.
- Unloading: compactor-ram load ejector, tips to rear.

Total Payload Capacity
- 11,350 kg.

Specific Features (Cont'd)

Shu-Pak II

Designed for two stream or wet/dry collection. The vehicle is equipped with two compartments, split horizontally with variable density packers for each compartment. The bottom packer is designed for high density compaction. The loading hopper is located directly behind the cab. The unit unloads by tipping to the rear. Tailgates for both upper and lower units are hydraulically actuated and work independent of one another. The top tailgate can be hinged from the top or bottom. With the latter arrangement, the tailgate acts as a ramp for dumping commingled recyclables.

Total Capacity
- 25.2 m^3.

Horizontal Split Body
- 60% top, 40% bottom (other split ratio's available upon request).Pak Mor Load Liner II RD6100

Dual chamber, rear loading compactor. The Load Liner II body can be equipped with various bins for expanded curbside sorting and collection capabilities. Several container or cart handling systems are also available for the chamber hoppers.

Total Capacity
- Varies depending on model type, available sizes are:
  13 m^3 (4.6 m^3 streetside chamber, 8.4 m^3 curbside).
  17.6 m^3 (6.9 m^3 streetside chamber, 10.7 m^3 curbside).
  20.6 m^3 (8.4 m^3 streetside chamber, 12.2 m^3 curbside).

Haul-All AP30, AP24 (see Figure 2)

The Haul-All Augpac trucks feature front end rear compaction compartments. Compaction is accomplished via screw feeders driven by hydraulic power pack. To prevent refuse bridging or hang-ups the screw are spring loaded from the driven end to allow axial deflection and are bearing less in the waste contact area. Waste or recyclables may be loaded into either compartment, variable compaction densities by the screws prevents recyclables breakage if desired. The front screw conveyor features a loading hopper pressure plate which force feeds the screw and is ideal for yard waste or tree climb volume reduction during loading. The compaction screws may be manually loaded directly or automatically loaded from low level curbside hoppers. Front section unloads by tilting to streetside while rear section is end dumping.

Front Section
- Capacity: 7.6 m^3.

Rear Section
- Capacity: 16.8 m^3.

Waste Types and Sources	Primarily wet/dry, though waste type may vary depending on requirements of local waste mandates.
Public Education/ Promotion/ Training	Residents must be trained to set out material in any appropriate fashion depending on the vehicle(s) selected.
Material Flow/ Handling Methods	Manual, though some vehicles are available with cart handling systems.
Key Issues in Municipal/ Resident Acceptance	Cost of providing service.
Multi-Unit Applicability	Bulk handling capabilities available with cart handling systems.
Implications for Other Aspects of Waste Management System	These vehicles are most cost effective when processing/disposal facilities are sited in the same location.

Financing and Economics

Capital Costs	Expected to be in the range of $150,000 - $175,000.
Operating Costs	Individual vehicle costs expected to be similar to existing vehicles. Overall collection costs are expected to be lower.

Performance

Material Quantities/ Capacity	See Detailed Description for capabilities of various vehicles.
Overall Unit Cost	In general the co-collection of two material streams with a single vehicle is expected to yield savings in the order of 20% compared to collection with two separate vehicles.
Energy Consumption	Expected to be similar to existing vehicles.
Durability/ Downtime	Expected to be similar to existing vehicles. Some problems may be encountered with initial production as the final "bugs" are eliminated.
Labour Skills Required	Class "D" licence.

Regulatory and Operating Environment

Government Regulations/ Standards	Vehicles are expected to meet appropriate standards.
Industry Standards	Vehicles are expected to meet appropriate standards.

Contacts

Private Sector

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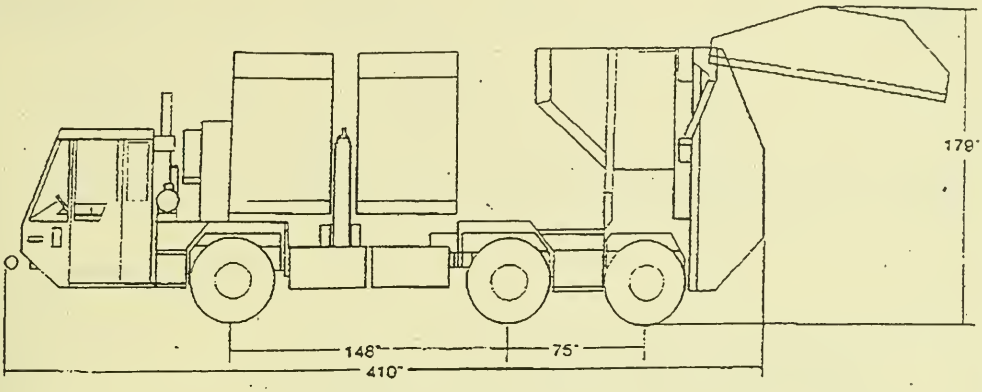
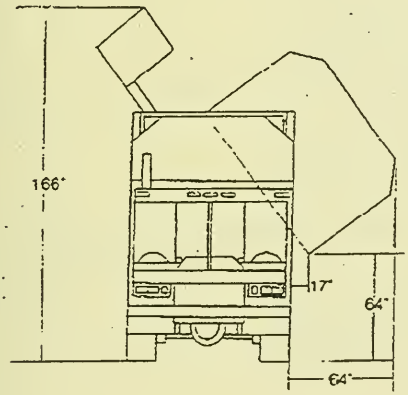
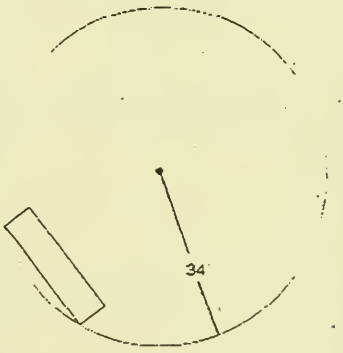
Personal Communications

John Bastion, Pak Mor Manufacturing Co.
Tom Cihowiak, Oshkosh Truck Corp.
Tom Cook, Shu Pak Refuse Equipment Inc.
Doug Vanderlinden, VQUIP Inc. (Haul-All Equipment Systems)





TURNING RADIUS = 34 FT



For reference only. The addition of options will change the listed standard dimensions in some cases. For certified dimensions, consult Oshkosh Truck Corporation.

Specifications, descriptions and illustrations in this literature are as accurate as known at the time of publication but are subject to change without notice. Ratings are general guidelines. Actual ratings vary with application and duty cycle

Illustrations may include optional equipment and accessories but may not include all standard equipment Consult Oshkosh Truck Corporation for additional information.

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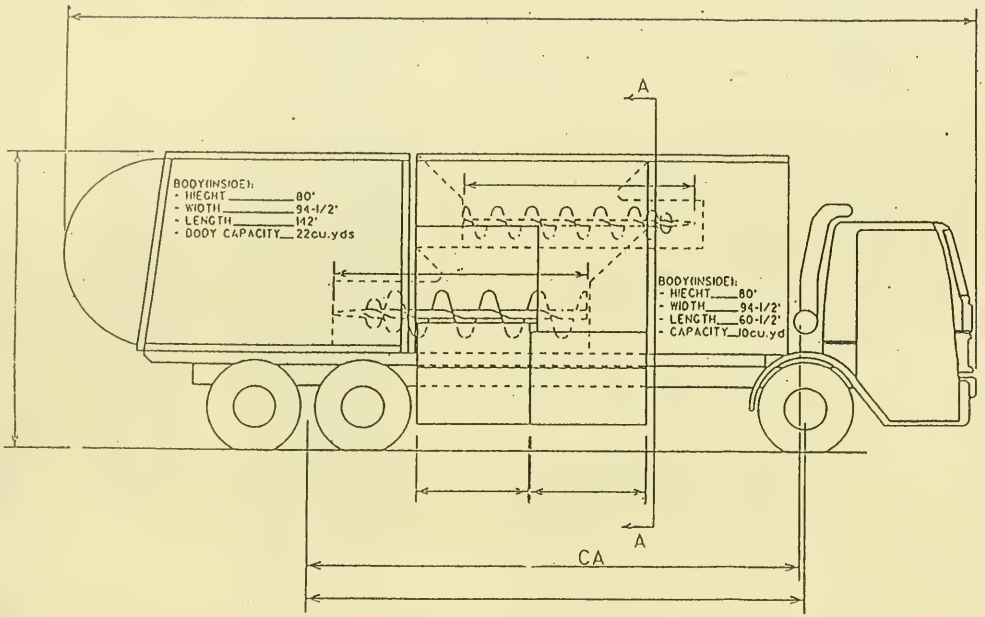
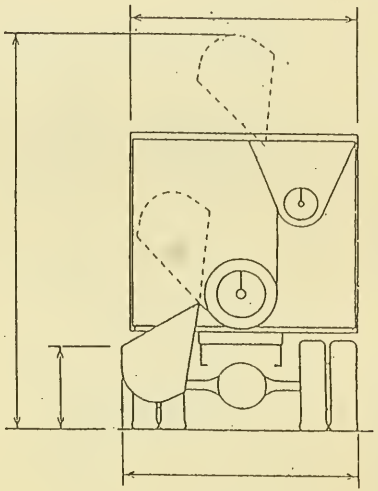
FIGURE N° I





SEC.A-A

HAUL-ALL EQUIPMENT LTD.					
NAME AUG PAC COLLECTION UNIT	SCALE NTS	SEQUENCE	MACH	NEW	REVISION
PART-NO.	OLD DRAWING NO.	1.	1.	1	
		2.	2.	2	
MATERIAL	PIECES REQUIRED	3.	3.	3	
		4.	4.	4	
DATE 5 MAY 92	DRAWN BY	5.	5.	5	
		6.	6.	6	

FIGURE N°2

9.0 OTHER

9.2 User Fees

9.2.1 User Fees - Profile # 1

General Overview

User fees, or variable rate pricing, include a range of approaches to charge users in proportion to the actual level of waste management services provided. The concept is often applied to IC&I waste management but until recently has been uncommon in the residential sector. Currently, ten U.S. states have legislation in place promoting or instituting mandatory variable rate pricing and several hundred U.S. communities have operational programs. (Skumatz, BioCycle December 1992). Well designed systems can be an equitable approach to fund waste management services and can provide strong educational and economic incentives to reduce waste.

This review provides an overview of user fee approaches. It also highlights a charge system introduced in Austin, Texas which varies with the size of can utilized.

Case Study / Subject Jurisdiction:

Austin, Texas

Demographics

Community Type:	Urban
Population:	460,000
Households:	112,000 serviced by City
Households in Pilot:	2,755

A "pay as you throw" variable rate program was successfully tested on a pilot scale from July 1991 to June 1992, as a key component of an overall waste minimization strategy. This approach will replace the flat per household fee on a city wide basis during 1993/94.

Political/ Social Factors

Solid Waste Advisory Commission, a council appointed citizens committee, strongly supported a variable fee approach.

Driving Forces

- State reduction goal of 40%; Austin responded with a 5 year business plan for waste minimization.
- Variable rate fee a key element.

Detailed Description

Overview of User Fee Approaches
A general overview of four volume based user fee approaches are provided in Table 1.

Detailed Description (Cont'd)

- Metered label systems in which homeowners attached a special tag to bags or cans are the simplest systems to implement, featuring minimal start up costs and considerable flexibility for users. The disadvantages with the approach include revenue instability and difficulty in monitoring.

- The advantages and disadvantages of using metered bags are similar to label systems, however, the handling and storage of bag inventories raises additional issues. Special consideration has to be given to bulky or oversized items.

- A waste collection subscription approach (as illustrated in the case study) utilizes a billing system based on can size. This system provides a more stable monthly revenue flow to the municipality and allows for detailed monitoring of waste generation and the impact of 3R programs. The billing approach may associate waste management with other municipally administered utilities. Homeowners have control over monthly rates through their subscription choice but do not have to handle special bags and/or tags regularly. The disadvantages of this approach include limited incentive to reduce once the minimum subscription is reached and relatively high program administration costs.

- Container billed systems require waste collectors to record the number of containers set out by each household. This billing system has the highest administrative cost, however, it builds a detailed record of collections and provides householders with simple and very flexibility collection options. This approach can be a first step to a more precise system of weight based billing. As with the subscription approach, this system could work well in conjunction with standardized containers and mechanized collection.

Often a combination of approaches will best meet the needs of a community.

Specific Features

Austin, Texas Approach

Specific features of Austin's variable rate subscription approach include:
- Option of three cart sizes, 30 gallon at $CND 8.24/month, 60 gallon at $CND 12.36/month and 90 gallon at $CND 16.48/month.
- Additional stickers are available at $CND 12.71 for five stickers to supplement the monthly subscription.
- Free first time cart exchange, $CND 19.07 for subsequent changes.

Specific Features (Cont'd)

- Billings based on cart size "subscription" and issued monthly.
- Collection frequency reduced to once per week from twice weekly.
- Same day no charge curbside recycling and grass/leaves pickup.
- No charge bulky goods and brush pickup twice/year.
- New semiautomatic lifter on collection vehicles designed for the distributed carts.

Waste Types and Sources

- Generally, user fees can be applied to all waste types and sources.
- Rates often vary between mixed waste, recyclables and other special waste streams.
- Austin applies fees to mixed waste only, recyclables and yard wastes are collected at no charge.

Public Education/ Promotion/ Training

Comprehensive public education program is a key element in successful implementation of user pay systems. Residents must be aware of all the operational details of the program (where to buy tags or how to change their service level, for example) and the diversion options offered. Public information programs providing details of true waste management costs and current financing methods, prior to new user fees, can address potential concerns over double taxation. The public education component in Austin's pilot was extensive and considered to be extremely important. Components of the city wide education program include:

- Direct mailings to homeowners as they are phased into the program.
- Local television airing prepared video.
- Newsletter.
- Information phone line.

Key Issues in Municipal/ Resident Acceptance

Public acceptance of user pay systems is generally high in the U.S. jurisdictions reviewed. Often these systems are viewed as more equitable than a property tax or fixed fee approach.

Key elements in resident acceptance are:

- Public involvement in program design.
- Political support.
- Extensive promotion/education.

Customer attitude surveys in Austin found the majority of residents were well informed and pleased with the pilot program, 82% rated the services as good to excellent.

- Most positive comments focused on:
  - The benefits of a cart,
  - The variable rate, and
  - Recycling in general.

Key Issues in Municipal/ Resident Acceptance (Cont'd)

- Negative comments included dissatisfaction with the once per week collection and the separate billing system.
- At the time of the survey a private firm was contracted for administration of the billings. Customers felt that the level of service provided was inadequate with this contractor. The responsibility has been transferred back to the city and complaints have subsided.

Applicability to North/South, Urban/Rural

- Fee systems can be adapted to the needs of any jurisdiction.
- Variable fee may be easier to introduce where a waste management charge already exists, as may be the case in rural Ontario communities with private waste collection.

Multi-Unit Applicability

- Application of user fees to multi unit complexes is generally problematic, as it is difficult to distinguish waste origin by unit.
- Building manager may be able to play a role in distributing costs to individual units based on parameters such as unit size.
- Austin pilot revealed difficulties in applying the system to medium density multiple-unit rental complexes - renters refused to subscribe to the system wastes put out in unauthorized bins.
- Noncompliance penalty (refusal to pick up) found to be inadequate as it was not possible to assign waste to particular units.
- Increased penalties using local ordinances or codes and enforcement officers being considered but limited usefulness without assigning origin.
- Due to these difficulties, the City wide program will likely be limited to complexes of up to five units.

Implications for Other Aspects of Waste Management System

- User pay initiatives are often introduced concurrently with new diversion options, 3R education programs or broad system improvements.
- User pay systems often play a complementary role within an overall waste diversion strategy providing an added incentive for households to participate in programs.
- Increased illegal dumping, open burning or impacts on the IC&I system are often cited as potential concerns with a new user pay initiative.
- Austin did not experience an increase in illegal practices with the exception of non compliance with the new system in some multiple unit areas.
- Experience from a variety of programs indicates that where necessary, the incentive for illegal activity can be reduced by:
  - Incorporating a base level of service for all households in the system,
  - Amending regulating bylaws and enforcement procedures,
  - Encouraging community support and positive peer pressure,

Implications for Other Aspects of Waste Management System (Cont'd)

- Use of locks on commercial dumpsters, and
- Providing an alternative for residents to handle excess volumes or bulky items.
- Austin did not report any increase in contamination of recyclables.

Financing and Economics

Capital Costs

- Generally, capital costs are minimal with a tag approach and increase where an inventory of carts is required.
- Austin purchased carts at approximately $CND 50/cart and distributed them free of charge.

Administrative Costs

Increased administrative costs are common among various user fee approaches and relatively high with a variable subscription approach. Austin's administrative staff requirements for billings and ongoing customer support are estimated to increase from two person years prior to the program to ten person years with city wide application of variable rates.

Education and promotion - $CND 6.00 to $CND 7.00 per household for the Austin pilot; expected to decrease with city wide application.

Revenues

Austin's rate structure was designed to be revenue neutral i.e. to approximate revenues expected through the previous flat monthly charge system.

- 2,584 out of the 2,755 households in the pilot had a moderate to significant reduction in their monthly bill.
- Overall, the pilot resulted in somewhat lower revenue, however, Austin expects to reach the revenue neutral objective with city wide application.

Setting/ Adjusting Rates

Setting appropriate (defensible) charges is an important element of the user fee system. Considerations involve:

- the characteristics of the service demand,
- revenue requirements derived from a review of fixed and variable costs, and
- special issues such as variable rates to enhance recycling incentives and equity concerns.

- Possible requirement for a base rate to reduce variation in revenue on a month to month basis
- Austin's rates were set to recover all fixed and variable costs associated with the full waste management system.
- The differential in rates between can sizes (currently approximately $CND 4.00) is being reviewed, steeper differentials may be required to further promote 3R activity.

Performance

Waste Diversion Impact

Several studies (including R. Repetto 1992) have shown that user fees tend to reduce the volume of household waste, particularly where curbside recycling is available.

The marginal impact of introducing a user pay system in any particular community will depend on:

- The extent of diversion support options available,
- The diversion level already achieved by the community,
- The community character (such as multi-unit/single family diversity and income/age profiles), and
- The extent and quality of public information associated with program introduction.

As is often the case, identification of the marginal impacts of the user pay component in the Austin system is difficult because other waste reduction initiatives were introduced at the same time.

- The six month pilot study showed that overall, test households produced 23 percent less waste than other area households in the city.
- Yard waste separation and collection was considered to be the major contributing factor.
- Approximately 18 percent of total wastes in the pilot were yard wastes with an average of 8 tonnes per week collected.
- Increased recycling accounted for an additional five percentage points of the difference.
- Reduction initiatives may have played a role, however, the impact was not measurable in the pilot figures.

Observed/ Measured Impact on 3R Awareness, Participation

- User pay provides an economic incentive to practice the 3Rs.
- These programs can also provide a strong educational benefit, increasing awareness of waste generation and receptiveness to 3R options.
- Emmer and Hall (1992) found that initial differences in attitude toward recycling and user charges become less evident after an initial adjustment period. Citizens who had not recycled before the program, and saw no need to recycle, began to change their attitude and behaviour six months into a user pay approach.
- Within the Austin test area, participation in recycling went from 50 percent prior to the program to 69.5 percent immediately upon introduction and 80.6 percent six months into the program.

Labour Requirements

City wide application of Austin's approach will require customer support and billing staff increases of eight person years from the current two person administrative staff.

Net Employment Impact

In the Austin case, due to the move to semi-automated collection concurrent with the new fee system, a net reduction in employment is expected.

Design and Siting Requirements/Issues

Stakeholder Roles

- In the Austin system, household roles are a simple indication of cart size preference and curbside separation.
- The City maintains billing and education/ promotion program

Contacts

Governmental

Joe Word Assistant Director Environmental and Conservation Service Department Solid Waste Division City of Austin, Texas (512) 472-0500

Research References

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Skumatz, Lisa, A. and Zach, Philip Alan; "Variable Rate Initiatives at the State Level". Biocycle December 1992, p. 67.

Word, Joe, D., Higginbotham, Katherine and Pluenneke, David, R.; "Variable Rate System Works In Texas". Biocycle July 1992, p. 52.

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TABLE 1:
USER PAY APPROACHES TO WASTE MANAGEMENT
REVIEW OF VOLUME BASED SYSTEMS

A: Metered Labels

Specific Detail and Options	Operational Examples	Advantages	Disadvantages
• Tags or stickers attached by user to containers or bags • Initial no charge base service an option or issuance of basic number of labels • Lables issued by jurisdication, available locally and/or mailed to users periodically • Preferential rate for recyclables an option • Volume restrictions possible, ie, tags could be placed on containers up to a certain size • Weight restrictions possible	• Nanaimo, B.C. • Readington, N.J. • Somerville, N.J. • Northfield, Minn.	• Administratively simple • Residents can use own containers • Residents pay only for what they use; if residents have excess tags from general distribution they may be traded or sold. • Lables may be affixed to bulky items	• Revenue can be unstable, difficult to predict • Tags may blow off or be stolen • Difficult to monitor weight/volume restrictions precisely

B: Metered Bags

Specific Detail and Options	Operational Examples	Advantages	Disadvantages
• Bags issued by jurisdiction and made available locally • Possible weight restrictions • Initial no charge basic service an option, Bag restriction on basic service, additional waste must be in designated bags.	• Village of Ilion, N.Y. • Newport, N.Y. • Perkasie, Penn. • St. Cloud, Minn.	• Similar to metered labels • In addition: collection may be more efficient than with cans and authorized containers easily identified if bag is unique	• Bags require shelf space at municipal offices and/or retail outlets, compensation may be required to encourage retailers to handle them • Home owners may prefer containers • Bags are a further source of waste • Specialized bags will compete with local market for bags, manufacturers may object • Bulky items require special consideration • Difficult to monitor weight/volume restrictions precisely

C: Waste Collection Subscription

Specific Detail and Options	Operational Examples	Advantages	Disadvantages
• Residents subscribe to use of a particular bin size for a set period of time and are charged on that basis • Charge may include rental of authorized bin	• Olympia, Washington • Seattle, Washington • Walker, Minn. • Austin, Texas	• Where standardized containers are used, automated collection service is possible • Predictable revenues • Billing system provides flexibility • Graduated rates can provide strong 3R incentive • Data base developed for further analysis	• Limited flexibility for users, no incentive to reduce within the subscription period • Billing system adds complexity • Inventory of bins required if rental an option • Difficult to accomodate peak times such as Christmas • No incentive once lowest subscription reached • Bulky items require special consideration • Frequent service changes can increase administrative costs

D: Container Billed System

Specific Detail and Options	Operational Examples	Advantages	Disadvantages
• Generators are charged on the basis of the number of containers set out • A standard rate may apply for each container or graduated higher rates applied as the number of units increase		• Billing flexibility • Graduated rates can provide strong 3R incentives • Data base developed for future analysis • Standardized containers improve efficiency • Where standardized containers are used, automated collection service is possible	• Added administrative costs for billing system • Odd sized articles require special consideration

Reference. User Pay Study for Gananoque GLL March 1993.

9.0 OTHER

9.3 Waste Program Computer Modelling Software

9.3.1 Waste Program Computer Modelling Software - Profile # 1

General Overview

Computer models for planning recycling and solid waste management systems can be a valuable tool for the system designer/planner/operator who wishes to evaluate numerous 3Rs programs options.

Driving Forces

Improved planning capability.

Detailed Description

The recent emergence of user friendly computer models for planning recycling and solid waste management systems is based in part on the wide spread usage of personal computers (PCs). However, computer models cannot replace the detailed evaluation and implementation planning that goes into creating a successful program. Conclusions drawn from computer modelling are only as good as the data and assumptions used to input information.

All the recycling and solid waste modelling programs share the same basic structure:

Input assumptions - define the specific conditions about the system to be modeled, e.g. households served, waste generation rates, waste composition, diversion rates, equipment, operations, maintenance costs, inflation and growth factors, material sale prices, discount rates, etc.

Computations - model to a greater or lesser degree relationships between and among the input data as they would occur in real life.

Outputs - results may be organized in a wide variety of reports or output data tables that summarize certain economic and/or performance aspects of the recycling or solid waste system under consideration.

The user can ask a series of "what if" questions by varying the input data and assumptions and compare their impact on the output data.

Detailed Description (Cont'd)

However, reality can never be completely reduced to numbers and mathematical relationships. Solid waste systems include many soft variables - critical bits of information that cannot be quantified. A fundamental weakness of all computer models that perform economic analysis is their projection of future costs and revenues.

Specific Features

There are two general types of computer models:

Comparative - produce output data for various systems, allowing the user to compare and combine them in an iterative process.

Optimization - take a distinct and fixed set of system components and calculate the optimum mix to minimize cost and/or maximize waste diversion.

Computer models may be classified by their functional aspect. Currently, there are models available for:
- Entire integrated systems including both collection and facilities.
- Integrated systems of various facilities, treating collection systems as fixed or outside costs.
- Collection systems.

A number of representative models (which can be run on IBM-compatible PCs) are briefly described:

NAPCOR/Eastman Chemical model:
- NAPCOR does not release the software program.
- Instead the developer, David Cornell, works with the user to develop the input data, test the various scenarios desired and provides a report of the final results.
- Model has been used at the state or regional level for planning and policy development and also at the municipal level to evaluate recycling program options.

Based on specific projects and modelling of "typical" communities, a number of general conclusions can be made:
- The cost of curbside collection in low density areas quickly escalates as the distance between stops and time off-route increases.
- Choice of collection truck and crew size affect collection costs significantly.
- High participation and capture rates are essential for cost-effective programs.
- Collecting and processing a broad range of materials gives the best assurance that a recycling system will achieve the lowest possible cost per tonne.
- Avoided disposal costs must be high to sort and process recyclables cost effectively for smaller towns.

Specific Features (Cont'd)

- It is important to distinguish between the disposal costs a community may charge at its own facility and the true costs of current operations or replacement with a new disposal facility; the model calculates the tipping fee for new state-of-the-art landfill as a measure of the true cost of disposal against which the cost of recycling can be compared.
- The model also calculates the cost of adding materials to a collection and processing program.

The NAPCOR model was used by different jurisdictions, including:
- City of Milwaukee, Wisconsin, gathered data from a pilot curbside collection program and projected such key program parameters as the number of trucks, personnel requirements, total capital costs, costs per household and quantities captured.
- Tennessee and Virginia use it to develop recycling data for major urban areas and define cost-effective collection systems for rural areas.

RecycleWare computer model is distributed by Recycle Worlds Consulting:
- Focuses on modelling collection systems to address one of the major questions asked by users - whether their curbside recycling program should collect materials commingled or separated.

RecycleWare was used in different cities:
- City of Janesville, Illinois, evaluated three recycling systems, drop-off sites,separated curbside collection with a compartmentalized truck, commingled curbside collection with a packer truck.
  - Participation rates were set between 60-70%, weekly versus bi-weekly collection comparisons were made, collection versus non-collection of yard waste was analyzed.
  - Results found that drop-off sites are always economically viable but they get low diversion rates.
  - Bi-weekly curbside commingled collection with a packer truck was 10% less expensive than no recycling, but it was 10% more expensive for weekly collection.
- City of Madison, Wisconsin (45,000 households) wanted quantitive information about citywide recycling system alternatives in order to make policy and planning decisions.
  - City considered five recycling systems; 1) drop-off centres only, 2) same day curbside collection of separated recyclables, 3) same day curbside collection of commingled recyclables, 4) same day curbside collection of commingled recyclables with some week-end collection with existing packer fleet, 5) same day curbside collection of commingled recyclables using a new fleet of divided packers for both recyclables and refuse.
  - For each of the systems pessimistic and optimistic assumptions were made.

Specific Features (Cont'd)

- A 10-year lifecycle cost analysis found that under optimistic conditions, systems 1,3,4, and 5 would be less expensive than a no-action alternative; however, only options 1 and 5 would be less expensive under pessimistic assumptions (subsidies would be required for other system alternatives).
- City initiated its mandatory curbside program in February, 1991 collecting commingled glass, aluminum, steel, PET and HDPE in clear plastic bags; OCC flattened and bundled; ONP bundled.

WastePlan - computer model developed by the Tellus Institute licenses states or regional agencies, which in turn distribute it to smaller entities. The WastePlan model is used in different states, e.g.:

Delaware used WastePlan to:
- Model the current waste management system.
- Model a system with 15 state mandated drop-off centres.
- Model a comprehensive curbside recycling program.
- Identify an integrated system that is cost effective and environmentally sound.
- Output data include quantities of recyclables diverted, amount of residuals, Btu value, effect on landfill life, program costs.

Vermont used WastePlan to:
- Evaluate infrastructure and economics of interregional cooperation in the development of recycling and solid waste management facilities.
- Estimate the costs for collection systems, recycling facilities, yard waste composting, municipal solid waste composting and landfilling at three levels of regionalization.
- The model found that some degree of regionalization is cost effective for recycling facilities and for landfilling residuals from recycling and composting.

Cornell University, Waste Management Institute used the model to
- Study the effects of a countywide curbside commingled collection program.
- Study showed that potential savings were significant enough to make a county-level waste reduction staff position viable.

Solid Waste Management Options for Municipal Planners (SW-Options) is a computer software package developed for evaluating and selecting municipal waste options.

- User is asked to enter information describing community and waste management existing and proposed practices.

Specific Features (Cont'd)

- SW-Options describes the effects on the waste stream and the costs required to implement proposed practices. However, because the income that the community might receive for recovered materials and/or energy is so very location-specific, no attempt has been made to include a "revenue" estimate in the economics.
- The computations in SW-Options are based on national averages and trends, they do not account for geographical, demographic, legislative, or other factors which can greatly affect the results.
- A tutorial session will "come up" automatically during the first run of SW-Options.
- By selecting different "scenarios", various waste management approaches can be compared and their effect on a community's waste stream can be analyzed.
- Examples of management options:
    - Material Recovery - including selection of specific recyclable materials and collection method.
    - Composting - including selection of which waste materials are to be composted, composting method and collection method.
    - Energy Recovery - with choices including heat recovery (for steam or electricity markets) and production of refuse-derived fuel.
    - Incineration - only for volume reduction (with the option of reconsidering heat recovery).
    - Special Waste Collection - including household hazardous waste , tires, pallets, engine oil, and construction and demolition debris.

CurbConserve is an optimization model, originally developed for the State of Washington to help determine best waste management practices:

- Has a fixed set of components.
- Determines the lowest cost combination of practices.
- Allows the user to vary input data to assess the relative impact on the cost analysis.
- Input data includes waste stream composition and quantity, recovery rates, market prices for materials based on how they are separated, collection costs parameters for vehicles and performance and fixed unit costs for processing and disposal.

Integrated Waste Management System (IWMS) computer model:

- Concentrates on configurations of facilities for recycling, composting, waste-to-energy, landfilling and landfill mining.
- Does not model collection and transfer systems.
- Requires a relatively limited amount of input.
- Does not attempt to model exact technologies.

Specific Features (Cont'd)

- Consists of a performance model to simulate the flow of waste stream components through facilities and a cost model that calculates total annual costs and costs for each facility considered.
- User input can be varied to change the flow of waste through facilities.
- Includes disks, default data and documentation for a cost of $CND 1100.
- A future version of the program may be a public domain software.

PRIDE, The Plastic Recycling in Defined Environments model:

- Developed at the Center for Plastics Recycling Research at Rutgers University.
- Designed as a planning tool for recycling collection systems.
- A separate module for sorting systems has been developed.
- Model inputs include policy data, collection efficiency, recovery rates, waste composition, collection equipment parameters and labour costs.
- Output data includes revenue by material, costs by each component of the program, non-recyclable costs by component, a cost summary of material for each component, and a cost on a weight and volume basis for each recycled material.
- The model costs $CND 90.

Repep computer model was developed for the Illinois Department of Energy and Natural Resources:

- Considers only recycling collection.
- Simple spreadsheet program evaluates costs and performance of various collection options at the community level.
- Works only with the Smart spreadsheet software.
- No cost for model (assuming that one owns the proper software).

Waste Types and Sources

Solid waste, recyclables, compostables.

Applicability to North/South, Urban/Rural

Applicable to any community type.

<u>Financing and Economics</u>

Operating Costs

Information requested but not provided or available.

Administrative Costs

Information requested but not provided or available.

Research References

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Resource Recycling, June 1990
Computer models for recycling and solid waste management: part 2
Resource Recycling, February 1991

Does the Solid Waste Management Hierarchy Make Sense?
School of Forestry and Environmental Studies, Yale University

Section 10

Systems

10.0 SYSTEMS

10.1 Urban Communities Achieving High Diversion

10.1.1 Urban Community Achieving High Diversion

General Overview

In 1991, the City of Seattle became the first municipality in the U.S. with a population greater than 500,000 people to report diversion of over 40% of its total waste stream.

The success of Seattle's waste diversion programs can be attributed to five main factors:

1. Strong environmental interests of its residents;
2. Convenient curbside and drop-off collection services for dry recyclables and yard waste;
3. Volume based user fees (based on a variable can rate structure) for residential waste collection;
4. Effective promotion and education programs which focus on public involvement and community outreach; and
5. The existence of effective private sector recycling activities which reportedly achieved a 24% recovery rate from the residential and commercial sectors before any municipal programs came on line.

Implementation of waste diversion initiatives in Seattle stemmed from the City's Integrated Solid Waste Management Plan completed by the Solid Waste Utility (SWU) in 1989. The plan was created to guide the City in planning and implementing programs to achieve the goal of 60% total waste diversion by 1998.

Case Study / Subject Jurisdiction:

Seattle, Washington

Demographics

Community Type:	Urban	Land Area:	92 sq. mi.
Population:	512,000	Households Served:	148,500
Households:	244,000	Number of Businesses:	30,000
Total Residential Waste:		285,762 t ('91)	
Total Commercial Waste:		405,509 t ('91)	

Political/ Social Factors

- City of Seattle's Integrated Solid Waste Management Plan.
- 40% diversion by 1991.
- 50% diversion by 1993.
- 60% diversion by 1998 (waste reduction to account for 2.5% of total).
- Remainder of waste to be shipped by rail to a landfill located in eastern Oregon.

Driving Forces

- Closure of two City landfills in 1983 and 1986. Both subsequently became Superfund sites with estimated cleanup costs exceeding $CND 115 million.
- When Seattle started disposing of its waste at the King County owned landfill in January 1987, tipping fees more than doubled to $CND 26.54 per tonne.
- As a condition of its contract with King County, Seattle had to develop and implement an alternative disposal option by 1993 or be locked into the County system for 40 years.
- City examined incineration as a waste disposal alternative in 1987.
- Environmental groups vigorously opposed this option and City Council eliminated incineration as an alternative in October, 1988.
- The expense of closing its landfills combined with the need for alternative disposal strategies provided the impetus for the 1989 Integrated Solid Waste Management Plan.

Detailed Description

Specific Features

- Seattle has implemented a wide variety of waste reduction, recycling and composting programs in order to achieve its 60% total waste diversion goal by 1998. Key features of the programs are highlighted below:

Waste Reduction

- Seattle uses three main strategies to achieve its waste reduction goal of 2.5% by 1998: backyard composting programs; consumer education programs; and the variable can rate structure. (The effects of the variable can rate are not counted towards the waste reduction goal).
- Three consumer education programs of note include the "Shop Smart" program, the "Use It Again, Seattle!" directory, and "The Environmental Allowance Program".
- Seattle developed the "Shop Smart" and "Use It Again" programs in cooperation with the Washington State Energy Office.
- The "Shop Smart" program is a retail-based waste reduction education program focusing on reducing packaging waste. The two main components are grocery store walk-through audits and in-store educational materials. The theme of the program is "Prevent Tomorrow's Garbage Today".

Specific Features (Cont'd)

- The "Use It Again, Seattle!" directory promotes waste reducing services available in Seattle. It provides a listing of rental, repair, and used goods services.
- The "Environmental Allowance Program" was developed in 1986 to fund external proposals for research and development. In 1991, funds were concentrated on community-based proposals for waste reduction.

- Seattle's variable can rate structure for residential waste collection has been in place since 1981.
- Current ('93) rates per month are $CND 14.62 for a 19 gallon "mini" container; $CND 19.05 for 32 gallon; $CND 38.09 for 60 gallon; and $CND 57.14 for 90 gallon.
- The variable can rate allows residents to pay a lower garbage rate if they use fewer garbage cans or use a smaller container.
- Residents can dispose of occasional "extra" waste by purchasing stickers at $CND 6.36 each to attach to the type of container used (e.g., plastic bag, cardboard box).

Recycling Potential Assessment Model

- Seattle developed a Recycling Potential Assessment Model (RPAM) to assist in the development of its Integrated Solid Waste Management Plan.
- The RPAM is a forecast model which projects waste stream growth, predicts the impacts of waste reduction and recycling, and develops long term system costs for recycling and disposal options.
- The model is the main tool Seattle uses to evaluate its progress towards the 60% total waste diversion goal by 1998.

Curbside Collection of Dry Recyclables

- Seattle's curbside recycling program serves single-family through four-plex households. Two different methods are used for collection of dry recyclables.
- In the north section of the City, source separated materials are collected weekly in three bins; one for glass, aluminum and tin cans, and PET and HDPE bottles; one for mixed paper; and one for newspaper.
- In the south these same materials are collected commingled on a monthly basis from a single 90 gallon container.
- Materials collected from curbside are processed at materials recovery facilities owned and operated by two private waste management companies.
- About 15% of Seattle's multi-unit buildings are currently provided with a recycling collection by two small private companies.
- City-wide multi-unit recycling program will be implemented throughout 1993 and collections will be provided by two different private waste management companies.

Specific Features (Cont'd)

Organics Programs

- Seattle mandated separation of yard waste from the residential waste stream in January 1989.
- Three programs are available to residents to manage organic waste: backyard composting, curbside collection and transfer station drop-off.

- About 25,000 home composting bins have been distributed to date.
- Seattle plans to distribute home composting bins to about 40,000 households (25% of total single-family through four-plex) by 1998.
- Backyard composting education includes composting demonstration sites, a team of trained, volunteer Master Composters, free literature on ways to compost and a compost hotline.
- Citywide curbside collection of yard waste began in January 1989. In the northern two-thirds of the City, yard waste is collected on a weekly basis all year long on the same day as garbage collection.
- In the southern third, yard waste is collected biweekly on the same day as garbage collection from March to October and monthly from November to February.
- Residents and commercial haulers can also deliver separated yard waste to the two City-owned transfer stations.
- Yard waste collected from curbside and the transfer stations is processed at a privately owned composting facility operated by Cedar Grove Composting Inc.
- Other composting initiatives include the Seattle Pea Patch community garden program and the Seattle's Zoo program which produces and markets compost known as "Zoo Doo".

Transfer Station Recycling

- Seattle provides recycling drop-off depots at its two transfer stations located in the north and south sections of the City.
- Materials are accepted from residents and commercial haulers and include newspaper, mixed paper, glass, aluminum and tin cans, PET and HDPE bottles, yard waste, mattresses, lawnmowers, white goods, wood and used motor oil.
- Most materials can be dropped off for free.
- A household hazardous waste (HHW) collection facility was constructed at the south transfer station in 1988. Another HHW facility is planned to be constructed at a City maintenance yard in the north section in 1993.
- Seattle is planning to install mechanized sorting lines at its two transfer stations by 1994 to increase material recovery rates.

Specific Features (Cont'd)

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City Department Recycling and Market Development

- Seadrunar Recycling, a non-profit organization for drug rehabilitation of juveniles and adults, operates a multi-material recycling program in City offices.
- Materials collected include fine paper, newspaper, cardboard, glass, and aluminum cans.
- Interdepartment grant program developed by the Solid Waste Utility encourages City departments to implement waste diversion programs.
- Seattle has an extensive procurement program for materials with recycled content to stimulate market development.
- These materials include office paper, motor oil, building insulation, glass cullet, compost and plastic products.

Commercial Sector Initiatives

- Rate incentives are used to encourage waste reduction and recycling in the commercial sector.
- Commercial waste collection rates are regulated by the Washington Utilities and Transportation Commission (WUTC).
- Seattle works with the WUTC to establish a lower rate structure for recyclables.
- Seattle has developed a commercial audit program and conducts waste stream audits for businesses.
- In 1990, the City and the Seattle-King County Chamber of Commerce set up a non-profit organization called the Business Industry Recycling Venture (BIRV).
- The BIRV promotes business recycling by providing technical assistance and education. It also encourages businesses to "buy recycled" products.

Specific Features (Cont'd)	Demonstration Projects - Seattle has found that the use of demonstration projects are valuable to demonstrate action and show its commitment to recycling, to gain the confidence of elected officials and the public, to learn more about programs and to refine long term strategies. - The curbside recycling program, transfer station yard waste drop-off program and the addition of PET to curbside collection all began as pilots. - Seattle has completed pilot studies on residential food waste composting and a weight-based user fee system referred to as "garbage by the pound", and will also be taking the lead in a commercial food waste composting study with King County.
Waste Types and Sources	- Residential and commercial waste streams are targeted. - Dry recyclables collected include newspaper, mixed paper (includes magazines, corrugated cardboard, telephone books, junk mail, coupons, flyers, used envelopes, wrapping paper, cereal boxes, paper egg cartons and brochures), glass, aluminum and tin cans, and PET and HDPE bottles. - Materials collected from the yard waste program include leaves, grass clippings, brush, sod and pruning material.
Operational Responsibility	- Seattle's Solid Waste Utility has the authority to control residential and commercial waste. It exercises its authority over residential waste only. - The City owns two transfer stations and a long haul fleet and transports non-recycled waste to a landfill in Oregon. - Seattle has historically contracted out for garbage collection and recycling collection services.
Contractual Arrangements	- Seattle has entered into contracts with private companies for the collection, processing and marketing of dry recyclables and yard waste. - Seattle has entered into a 38 year contract to dispose of its non-recycled waste in a private sector landfill in Oregon.
Role/ Requirements of Resident, Private/ Public Sectors	- Residents must sign up for curbside collection of dry recyclables and yard waste. The dry recyclable collection is voluntary and residents are not required to pay for this service. - Subscribers to the curbside yard waste collection program must pay an annual fee of $CND 30.52. Residents can use any type of container no larger than 32 gallons to place yard waste at the curb. - Private sector companies, under contract with the SWU, are responsible for the curbside collection, processing and marketing of dry recyclables and yard waste. - Public sector responsible for the design, implementation and coordination of waste diversion programs in Seattle.

Public Education/ Promotion/ Training

- There are six key elements in Seattle's promotion and education efforts:
  1. Market research to determine what kind of program will work best in a geographic area and what messages will produce the highest participation for that program;
  2. Public involvement and community outreach in shaping program design and maintenance;
  3. Promotion campaigns tailored to target audiences (major promotion and education campaigns in Seattle are centred around direct mail pieces);
  4. Coordinating customer education efforts with other governmental agencies, community environmental groups and private businesses;
  5. Coordinating promotions and customer service; and
  6. Recognizing customer diversity.
- Seattle officials estimate that they spend about $CND 890,019 (1991) per year on promotion and public education. This works out to about $CND 3.81 to $CND 5.09 per household. About $CND 1.27 to $CND 2.54 per household is spent to kick off a new program.
- A major component of Seattle's promotion and public education efforts is the Friends of Recycling (FOR) volunteer program implemented in 1990.
- The FOR program is a community outreach program where trained volunteers are used to provide information to residents on Seattle's waste diversion programs and to sign-up residents for recycling programs.
- The program's focus has been on "neighbours talking to neighbours". Block Watch meetings are also used for communications.
- About $CND 76,287 to $CND 114,431 is budgeted annually for the FOR program.

Material Flow/ Handling Methods

- Dry recyclables and yard waste collected at curbside and City-owned transfer stations.
- Materials are processed at facilities owned and operated by the private sector.
- Private sector markets all materials.

Residue Management

In April 1991, Seattle began shipping by rail its non-recycled waste to a landfill in eastern Oregon.

Key Issues in Municipal/ Resident Acceptance

Strong environmental interests of residents combined with user pay system for residential waste collection, convenient recycling programs and an effective promotion and educational campaign results in high participation and diversion rates.

Applicability to North/South, Urban/Rural

- Concept of an Integrated Solid Waste Management Plan highly applicable to Urban whether north or south.
- May be a need for municipalities in rural areas to join together to develop an integrated plan.

Multi-Unit Applicability

System, as a whole, does not apply but multi-units accommodated by system.

Implications for Other Aspects of Waste Management System
High diversion rate reduces the quantity of waste requiring landfilling out-of-state.

Financing and Economics

Capital Costs

Information requested but not provided or available.

Operating Costs

Information requested but not provided or available.

Administrative Costs

Information requested but not provided or available.

Revenues

- Seattle received about $CND 63,573 in revenues from the sale of transfer station dry recyclables in 1989.
- Other revenues from the sale of dry recyclables are retained by contractors.

End Market Information

Information requested but not provided or available.

Financing Arrangements/ Issues

- Revenues for Seattle's Solid Waste Utility are primarily generated from the variable can rates for residential waste collection.
- Allocation of a one-can rate dollar is as follows:
  - Landfill closure - 16%
  - Recycling - 8%
  - Collection - 23%
  - Disposal - 15%
  - Billing/admin. - 13%
  - Taxes/net income - 15%
  - Miscellaneous - 10%
- Seattle's curbside recycling costs are covered by the basic can rate.
- Curbside collection of yard waste from households is provided on a fee for service basis.
- One issue Seattle has considered with its variable can rates is its increased exposure to financial risks. Revenues and costs can become less predictable.
- If revenues do not cover costs, Seattle must decide between service cut-backs and rate increases.
- To manage financial risks, the Utility monitors aggregate subscription levels, revenues and expenses on a quarterly basis.

Contractual Arrangements

Curbside Collection of Dry Recyclables

- Seattle has entered into contracts with two private waste management companies for the curbside collection, processing and marketing of dry recyclables.
- Contract with one company involves Seattle paying a flat fee of $CND 55.08 per tonne and a provision for a market risk sharing arrangement.
- Under this arrangement, base selling prices for various materials are set in the contract.
- If the market price for a material varies by more than 20% from its base price, Seattle shares with the contractor gains or losses from market fluctuations on a 50-50 basis.
- Contract with other company involves Seattle paying a flat fee of $CND 55.54 per tonne. There is no provision for a market risk sharing arrangement. Seattle provides a guaranteed payment of $CND 635,728 per year to the contractor for processing and marketing. Revenues from sale of materials remain with the contractor.

Yard Waste Program

- Seattle has entered into contracts with two private waste companies for curbside collection of yard waste.
- One contractor is paid a base price of about $CND 96.89 per tonne to collect waste from the south end and deliver it to the composting facility operated by Cedar Grove (this price also includes processing costs).
- Another contractor is paid a base price of about $CND 64.59 per tonne to collect yard waste from the north end and deliver it to Seattle's South Transfer Station. It costs Seattle about $CND 13.84 per tonne to ship the material to Cedar Grove.
- Seattle has also entered into a contract with Cedar Grove Composting Inc. to process the yard waste at a fee of $CND 14.42 per tonne. The contract also requires Seattle to purchase between 16,000 to 32,000 cubic yards of compost in 1994 for use as final cover for one of its closed landfill sites.

Setting/ Adjusting Rates

- The variable can rate structure was based on the pricing of cans at cost of service up to 1988.
- In 1988, Seattle decided that an inverted variable can rate structure was more consistent with its 60% total waste diversion goal by 1998.
- Under inverted rates, the price charged for a service is higher than the actual cost to operate it.
- The intent of an inverted rate structure is to encourage customers currently subscribing to higher levels of service to move down to a lower level (i.e., fewer cans).

Performance

Material Quantities/ Capacity

Curbside Collection of Dry Recyclables
- Collected about 43,817 tonnes of material in 1992.
- Breakdown of recovered material by type:
  - Newspaper - 35%
  - Mixed paper - 36%
  - Glass - 21%
  - Aluminum - 1.7%
  - Tin - 2.8%
  - Plastic (PET and HDPE) - 0.6%
  - Residue - 2.5%
- Average recovery of 27 kg per signed up household per month.

Yard Waste Program
- Collected about 42,184 tonnes of material in 1992.
- About 31,570 tonnes were collected at curbside and about 10,614 tonnes were self-hauled to Seattle's two transfer stations.
- Average recovery of 28 kg per subscribed household for curbside collection per month.

Backyard Composting
- Seattle estimates that the average household (single-family through four-plex) generates 235 kg of yard waste annually.
- Seattle expects that 70% of households receiving a bin will use it and will compost 70% of their yard waste.
- Thus, an average of 115 kg per household per year can be diverted for each bin distributed.

Overall Unit Cost

Information requested but not provided or available.

Unit Capital Costs

Information requested but not provided or available.

Unit Operating Costs

Information requested but not provided or available..

Waste Diversion Impact

- In 1991, Seattle estimated that it diverted about 42% of its total waste stream.
- Breakdown of total waste generation, amounts disposed and recycled by residential and commercial waste streams is as follows:

(1991 tonnes)	Residential	Commercial	Total
Generation	285,762	405,509	691,271
Disposed Waste	162,385	236,774	399,159
Waste Diverted	123,376	168,736	292,112
Percent Diverted	43%	42%	42%

Observed/ Measured Impact on 3R Awareness, Participation	- Participation in the curbside programs for dry recyclables and yard waste is measured by the sign-up rates for these programs. - Sign-up rates are defined as the ratio of the number of households registered for the service to the number of households eligible to receive the service. - For curbside collection of dry recyclables, over 95% of households in the north have signed up for a recycling collection while about 85% have signed up in the south (as of December 1992). - For the curbside yard waste collection, about 64% of residents had signed up for the service (as of December 1992).
Labour Requirements	- Seattle reorganized the Solid Waste Utility in 1987 to respond to its waste management needs. - Additional labour was required including the creation of a new Director position with a background in policy analysis, management and grass roots organization. - A Program Planning Unit was created to develop new waste reduction and recycling programs. - A Finance and Customer Service Unit was also created.
Labour Skills Required	- High - A range of diverse skills were required including economic and environmental analysis, recycling, conservation, planning, marketing, customer service and communications.
Net Employment Impact	Information requested but not provided or available.
Employee Health & Safety Issues	Information requested but not provided or available.

Design and Siting Requirements/Issues

Approvals Process, Timing Costs	- Planning process for Seattle's Integrated Waste Management Plan began in November 1987. - In October 1988, Seattle Council adopted the plan. - Seattle will review and revise the plan by 1994 and at a five-year intervals thereafter.
Conditions of Approval	Information requested but not provided or available.
Reporting Requirements	- The Recycling Potential Assessment Model is continually updated to include the most current information on: 1. waste stream composition; 2. economic and demographic changes which could affect waste generation; and 3. new data on the actual cost and performance of Seattle's waste diversion programs - Seattle uses these updates to monitor its system and plan for the future.

Regulatory and Operating Environment

Government Regulations/ Standards

- Both King County and the State of Washington have Market Commissions to improve markets for recyclable materials.
- County Commission promotes "buying recycled" and educates business and government about availability of recycled materials.
- County also developed a procurement ordinance which is being adopted by municipalities.
- State Marketing Commission developing incentives to attract recycling processing facilities to the state and to remove economic barriers to markets.

Industry Standards

Information requested but not provided or available.

Contacts

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Personal Communications

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10.0 SYSTEMS

10.1 Urban Communities Achieving High Diversion

10.1.2 Urban Community Achieving High Diversion with Focus on Organics

General Overview

Landkreis Giessen (District of Giessen or "the District"), located near the centre of (former) West Germany, has achieved more than 40% diversion of the residential waste stream since the late 1980s using predominately a three bin system - newspapers, magazines and specified household paper; food and yard waste; and remaining waste - plus a drop-off program for glass containers.

The District, with a total 1991 population of 230,000, is responsible for all waste management activities from 18 municipalities of varying sizes, socio-demographic characteristics and resulting waste generation characteristics.

The waste management system currently in place has gone through many changes over the last 20 years - from municipal solid waste composting in the early 1970s to the implementation of a private collection system for packaging waste in 1992 (German Green Dot system). In summary the following waste diversion initiatives have contributed to the current waste diversion level of more than 40% across the district:

- waste reduction & reuse 2%
- recycling 24%
- composting 18%

Case Study / Subject Jurisdiction:

District of Giessen, Germany

Demographics

Community Type:	Urban/Rural	Land Area:	85,500 ha
Population:	230,000	Population Served:	220,000
Households:	106,500	Households Served:	100,000
Total Residential Waste:		85,000	
Total Commercial Waste:		50,000	

Demographics (Cont't)

The 1991 population of each of the 18 municipalities was as follows:

Allendorf/Lumda	3,600
Giessen (City of)	71,750
Grunberg	11,950
Hungen	11,750
Laubach	9,500
Lich	11,350
Linden	10,700
Lollar	8,800
Pohlheim	14,900
Staufenberg	7,200
Biebertal	9,900
Buseck	11,100
Fernwald	5,900
Heuchelheim	7,200
Langgons	9,600
Rabenau	5,200
Reislirchen/Wieseck	8,400
Wettenberg	11,200

Political/ Social Factors

- District Council sits for a period of six years which often results in environmental initiatives being a key platform upon which a Councillor is elected.
- Residents of the District have been anti-incineration since the later 1980s which has resulted in the need for the Council to examine and implement other waste management alternatives.

Driving Forces

- The City of Giessen opened its municipal solid waste (MSW) composting facility in the 1973. The facility produced a compost that was widely used for the latter part of the 1970s. By the early 1980s, compost quality both chemically (e.g., heavy metals) and physically (e.g., fragments of glass) became a major concern. Basically, the production of a poor quality compost reduced the marketability of the material.
- Source separation for residential organics was implemented in the mid 1980s in the City of Giessen. By the late 1980s, most of the other communities in the District had implemented a source separation program for residential organics.
- Conserving space at the municipal landfill site is critical. Waste transportation and landfill tipping fees at private landfill sites in and near the District are currently over $CND 300/tonne. These fees are expected to rise to more than $CND 400/tonne.
- Incineration/energy from waste is viewed by the public as an undesirable waste management approach for the District.

Detailed Description

Specific Features

- The quantity (1992) of total residential materials generated in larger urban centres in the district ranges from 380 to 425 kg per person while in the smaller, more rural communities the range is between 300 and 350 kg.
- Since 1980, the District has implemented a wide variety of waste reduction, recycling and composting programs that have contributed to greater than 40% diversion rate (current) for the residential waste stream. Key features of the programs are outlined below:

Waste Reduction

- Home composting is the most widely promoted waste reduction initiative. Estimates suggest that 10% of the District's households (about 10,650) have become involved with home composting during the last five years.
- Subsidies are not offered for home composting units.
- Home composting has always been an activity for many households in the smaller, more rural communities within the District. As a result, District representatives do not have a good estimate on the total number of households that are home composting.
- The District has lagged behind many other German communities in waste reduction initiatives because landfilling has only recently become a problem (e.g., environmental concerns, diminishing capacity, etc.).
- The District is currently in its early stages of its waste reduction program for the business sector. The purpose of the program will be to offer educational materials and to act as a resource centre for local businesses.

Curbside Residential Recycling

- Curbside recycling of residential (specified) fibres serves all households including multi unit buildings.
- A blue rollout cart (typically 240 litres) is used to collect residential (specified) fibres on a monthly basis using a rear packer collection vehicle equipped with two cart lifters.
- Carts are placed at the curb by householders on the designated fibre collection day.
- Household packaging (i.e., packaging that has been marked with the Green Dot, for example, boxboard, plastic bottles, etc.) is collected every two weeks using large, yellow bags supplied to the householders. Bags are collected in a rear packer (compaction is used).

Specific Features (Cont'd)

- The Green Dot is a registered symbol belonging to Duales System Deutschland (DSD), an "industry funded organization" with more than 600 companies from the retail trade and consumer goods and packaging industries. The organization was formed in response to Federal legislation to avoid waste and recover secondary packaging materials in Germany. The principle system established runs parallel (dual) to the collection of regular waste, that is the collection and sorting of packaging waste either at the curb or through depots.

Drop-off Depot Recycling

- Drop-off depots (sizes range from 1.5 to 5 cubic metres) for glass containers are located throughout the District.
- Drop-off depots are collected on a weekly basis with the exception of some depots in the high traffic areas which require more frequent collections.
- Green Dot packaging is also collected at some depot locations in smaller communities in the District.

Residential Composting

- Curbside collection of residential organics (food and yard waste) serves all households including multi-unit buildings.
- A brown rollout cart (typically 240 litres) is used to collect residential organics every two weeks using a rear packer collection vehicle equipped with two cart lifters.
- Regular waste and residential organics are collected on alternating weeks.
- Carts are placed at the curb by householders on the designated organics collection day.
- All materials are delivered to the centralized composting facility (CCF), located in the City of Giessen.
- The CCF includes two semi-enclosed composting buildings and a large outdoor composting/curing area. All residential organics are placed into windrows and kept separate from other windrow operations (e.g., organics from commercial sources) because different management techniques are required.
- The residential organic windrows require on-going removal of plastic bags (typically achieved by a combination of the windrow turning machine and manual picking) and different bulking agents

Commercial/Institutional Sector Initiatives

- Little information was provided on dry recycling in the private sector. It was indicated that old corrugated cardboard, computer printout and plastic film were the three most common materials recovered from the commercial sector.
- Private landscapers collect the majority of the yard waste in the commercial sector (e.g., institutional buildings, etc.).

Specific Features (Cont'd)

- A mix of private landscapers and municipal workers collect yard waste from parks and other recreation facilities.
- Approximately 10,000 tonnes per year is delivered to the CCF from commercial/institutional sources.

Waste Types and Sources

- The residential waste stream is the target.
- Residential (specified) fibres collected at the curb include newspapers, magazines and specified "high-grade" papers.
- Residential packaging collected at the curb includes plastic (e.g., film, cups, blister packs, bottles, foamed plastics, etc.), metals (steel and aluminum) and laminated board packaging for liquid foods and other goods.
- Residential organics collected at the curb include food and yard waste.

Operational Responsibility

- The District has only full control over residential waste management.
- The District owns and operates the central composting facility
- The District owns and operates the main landfill site.

Contractual Arrangements

- Waste, residential (specified) fibres and residential organics are collected by the private sector under contract with the District.
- Residential packaging is collected separately by the private sector but not under contract with the District. (i.e., with permission to operate within the jurisdiction to fulfill the requirements of the German packaging laws)

Public Education/ Promotion/ Training

- Up until the early 1990s, public education, promotion and training were not key components of the waste management system in the District. This has occurred because contamination levels for both curbside fibre collection and residential organics are routinely below 3%. In addition, participation rates in most areas of the District are quite good.
- Recent investigations have identified that new initiatives will be required in some of the more problematic areas of the District (e.g., lower income neighbourhoods) because contamination has been noticeably higher.
- District officials indicated that the public is demanding to know more about the Green Dot system because of the extensive information campaign and media coverage of the pros and cons of this system.

Residue Management

- On average, less than 3% of the recyclable and compostable materials collected at the curb, under municipal contract, are not sent to end markets.
- All residential waste and residue from municipally contracted programs is delivered to the municipal landfill site.
- The Green Dot system is less than a year old in Giessen, therefore little local information on the performance is available.
- Estimates from other jurisdictions suggest that up to 50% of the Green Dot materials (by weight) currently do not make it to end markets.

Key Issues in Municipal/ Resident Acceptance

- The City of Giessen first used unventilated rollout carts for residential organics collection. These were eventually removed and replaced with ventilated carts after numerous resident and driver complaints.
- Residents were not offered a weekly collection service for residential organics. District officials indicated that since the switch to ventilated bins occurred, there has been a minimal number of complaints from householders.
- Residents in Giessen have become accustomed to rollout carts. As a result some are experiencing problems with using yellow bags for the Green Dot materials.

Applicability to North/South, Urban/Rural

The waste management system employed in the District is highly applicable to all areas of Ontario, in particular, those upper tier municipalities that have assumed (or will be assuming) responsibility for regional waste management initiatives.

Multi-Unit Applicability

- There are few "high-rise" buildings in the district. As a result, most multi-unit buildings have a designated "waste management area" near the parking lot of the building.
- Large rollout containers (e.g., 3 to 5 cubic metres), typically on wheels, are used.
- In most areas, the same collection vehicle used at the curb collects from the multi-unit buildings.

Financing and Economics

Capital Costs

- Collection vehicles for waste, residential fibres and residential organics - capital costs are paid by the contractor and are included in the contract price. Rear packer vehicles, typically 24 cubic metres, with two cart lifters cost between $CND 200,000 and $CND 250,000 per vehicle.
- All capital costs associated with the Green Dot system are borne by the private sector.
- Rollout carts for waste, residential fibres and residential organics - capital costs are paid by the District and/or the individual municipalities. Rollout carts costs range from $CND 50 to $CND 60 per cart.

Capital Costs (Cont'd)

- Glass depot collection vehicles - capital costs are paid by the contractor and are included in the contact price. Specialized vehicles with a loading crane cost between $CND 150,000 to $CND 200,000 per vehicle.
- CCF, landfill site, other waste management facilities - Information requested but not provided or available.

Operating Costs

- District officials quoted a total annual budget of $CND 16,000,000 to operate the waste management system. The operating budget includes all program operating costs, recovery of capital costs, reserve funds, contract costs, administrative costs, and public education and promotion costs (less revenues from composting). The following individual program costs estimates are based on information provided by District officials:

- Waste collection	$ 3,000,000
- Waste disposal	$ 1,000,000
- Recycling collection and processing (residential fibres)	$ 1,500,000
- Recycling collection and processing (glass)	$ 300,000
- Recycling collection and processing (miscellaneous)	$ 1,000,000
- Residential organics collection and composting	$ 2,625,000
- Other programs	$ 1,000,000
- Total Operating Cost estimate	$10,425,000

- All operating costs associated with the Green Dot system are borne by the private sector.

Administrative Costs

- Administrative costs (all programs)	$1,500,000
- Public education and promotion costs (all programs)	$ 700,000
- Capital recovery/reserve funds	$4,000,000
- Total Administrative (and other cost) estimates	$6,200,000

Revenues

- Revenues for recyclable materials collected under contract are kept by the contractor.
- Compost revenue is estimated at approximately $CND 500,000 annually (or 20% of composting operating costs).

End Market Information

- Markets for recyclables collected under contract are the responsibility of the private sector.
- Markets for newspapers, magazines and colour separated glass are strong and typically within a two hour drive of the District.
- Markets for packaging are the responsibility of the private sector companies involved in the Green Dot system. Currently a fee is paid to facilities that sort Green Dot materials by the DSD. In turn, recovered recyclables are delivered, without charge, to selected end markets.

Financing Arrangements/ Issues

- All residential waste management costs are paid by taxpayers (householders) through the tax system. On average, a household is charged approximately $CND 200 per year or an average of between $65 and $75 per person.
- All Green Dot system costs are borne by the DSD.

Contractual Arrangements

- Collection contracts with private sector companies typically last between 5 and 7 years.
- Per capita charges are typically the basis for a negotiated contract.

Setting/ Adjusting Rates — Information requested but not provided or available.

Performance

Material Quantities/ Capacity

- Curbside collection of residential (specified) fibres	15,000
- Depot collection of colour separated glass	3,000
- Curbside collection of residential organics	15,000
- Miscellaneous residential materials	2,000
- Total Residential materials diverted	35,000 tonnes

Overall Unit Cost — Information requested but not provided or available.

Unit Capital Costs — Information requested but not provided or available.

Unit Operating Costs

- Approximately $CND 6,500,000 is spent directly on waste diversion programs.
- Approximately $CND 9,500,000 is spent directly on other waste management programs including waste disposal and landfill replacement costs.
- Unit operating cost for waste diversion programs estimated at $CND 180 - 190/tonne.
- Unit operating cost for other waste management programs estimated at $CND 185 - 195/tonne.
- Unit operating cost for all waste management programs estimated at $CND $183 - 193/tonne.

Waste Diversion Impact

- The District estimates that between 40% and 45% of the residential waste stream is currently being diverted from landfill:
- waste reduction & reuse 2%
- recycling 24%
- composting 18%

Observed/ Measured Impact on 3R Awareness, Participation

- Home composting participation for "new participants" is estimated to be 10% of total households.
- Monthly residential fibre recycling participation is estimated at more than 95%.
- Drop-off program for glass containers is used by 60% of the householders (frequency unknown).
- Biweekly collection of residential organics has more than an 80% participation rate.

Observed/ Measured Impact on 3R Awareness, Participation (Cont'd)

- Participation rates for multi unit dwellings is unknown.
- The quantity of recyclables/compostables recovered from households in the larger urban centres is higher than in the smaller, more rural communities. For example, in Giessen, estimates suggests the following quantities recovered from participating households - 270 kg of food and yard waste; 200 kg of residential, specified fibres; 70 kg of glass containers.

Labour Requirements — Information requested but not provided or available.

Net Employment Impact — Information requested but not provided or available.

Employee Health & Safety Issues Information requested but not provided or available.

Design and Siting Requirements/Issues

Stakeholder Roles

District is responsible for:
- all residential waste management activities.

Local area municipalities:
- have "waste management representatives" who contribute as an "advisory committee" member to the District.

District residents:
- General public involvement in the planning of waste diversion programs is not a regular practice.
- "Green groups" take an active interest in opposing energy from waste facilities and poorly managed landfill sites.
- District officials indicated that the public is demanding to be more involved in the planning process. Some of this interest has stemmed from the extensive information campaign and media coverage of the pros and cons of the Green Dot system.

Approvals Process, Timing Costs

- Information requested but not provided or available for the District.
- Many German cities and/or groups of municipalities have undertaken (or will be undertaking) "waste management master plans" with emphasis placed on waste management facilities. The plans typically take about 10 years to complete and implement (five years to find a site plus another five years to design and obtain final approval). Plans that include energy from waste facilities typically take longer and are more expensive to prepare.

Environmental Issues

- Odours from the composting facility continue to be a problem during the summer months. Complaints from households have been recorded more than one kilometre away. The composting of wet grass has been the most problematic and resulted in a temporary ban on the collection of this material during the summer of 1992.
- Odours from the unventilated rollout carts for residential organics collection were dealt with by City/District officials (i.e., unventilated carts were replaced).

Conditions of Approval

- The operation of the composting facility and landfill site requires the District to monitor odours, other public nuisances and environmental parameters consistent with State and Federal legislation.
- Odour complaints regarding the composting facility have resulted in the District initiating a pilot processing project, at the same site, involving sophisticated odour control technology via the "modular box technology". The feedstock is processed in a fully controlled environment for 14 days with final curing taking place in the windrow system.

Regulatory and Operating Environment

Government Regulations/ Standards

- Information requested but not provided or available on the District of Giessen's waste management policies.
- Districts and/or large communities often establish their own waste management policies.
- Germany is made up of eight states, each state typically having its own waste management policy.
- At the Federal level, all waste management facilities must comply with the requirements as stated in Waste Avoidance and Waste Management Act (of 27 August 1986).
- At the Federal level, an Ordinance on the Avoidance of Packaging Waste (12 June 1991), applies "to anyone who, commercially or within the framework of any business undertaking or public body within the area of validity of the Waste Avoidance and Waste Management Act:
  1) manufactures packaging or products from which packaging is directly manufactured (manufacturer) or
  2) brings into circulation packaging, products from which packaging is directly manufactured or packaged products at any commercial level (distributors)."

Industry Standards

Information requested but not provided or available.

Contacts

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Research References

Literature Sources

Waste Avoidance and Waste Management Act (of 27 August 1986), Federal Department of the Environment, Nature Conservation and Nuclear Safety.

Ordinance on the Avoidance of Packaging Waste (12 June 1991), Federal Department of the Environment, Nature Conservation and Nuclear Safety.

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Personal Communications

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10.0 SYSTEMS

10.2 Rural Communities Achieving High Diversion

10.2.1 Rural Communities Achieving High Diversion

General Overview

City of Fennimore (pop 2,378) handles all residential and commercial waste generated in the Community. The implementation of mandatory recycling in the City of Fennimore for all households and businesses/institutions in 1989 has resulted in 38% diversion of municipal solid waste from landfill in 1990. City of Fennimore received Best Overall Program in Rural Area award from the Institute for Local Self Reliance's Record Setting Recycling Contest 1989.

Case Study / Subject Jurisdiction:

Fennimore, Wisconsin

Demographics

Community Type:	Rural	Land Area:	5 km^2
Population:	2,378	Population Served:	2,378
Households:	970	Households Served:	970
Businesses:	100	Businesses Served:	96
Institutions:	5	Institutions Served:	4
Total Residential Waste:		588 tonnes	
Total Commercial/Institutional Waste:		572 tonnes	

A rural community located in Grant County 68 km northeast of Dubuque, Iowa, and 113 km west of Madison, Wisconsin.

Political/ Social Factors

- City of Fennimore made recycling mandatory on May 1, 1989 for newspaper; brown, green, and clear container glass; aluminum; ferrous metals; HDPE and PET plastic containers, corrugated cardboard; and mixed paper.
- State of Wisconsin has forbidden landfilling of yard waste since 1985.
- Mandatory State recycling legislation for plastic to be put in effect 1995.

Driving Forces

- In 1988-1989 Fennimore City Council members visited several recycling programs in Wisconsin in order to develop the best recycling program for community.
- The landfill closed in 1990 at which time the City hauled waste to Muscoda Incinerator approximately 40 km North of Fennimore at a cost of $CND 45/tonne for January - March 1990 and then $CND 45/tonne to transfer station in Cuba City, Wisconsin.

Detailed Description

- System relies heavily on exceptional participation of residents, businesses and institutions.
- High degree of source separation required at the curb with strict monitoring of non-recyclable wastes by collection crews.
- The City owns and operates its own materials processing centre with no materials rejected because collector controls the quality of materials at curbside.
- A strong emphasis on backyard composting (1/3 of residents have backyard composting areas) due to State legislation forbidding landfilling of yard waste.
- Waste currently hauled by private hauler from transfer station in Cuba City to landfill in Delavan.

Specific Features

- Refuse is collected from residents, businesses, and institutions once a week.
- Non-recyclable wastes must be placed in clear plastic bags which can be purchased at the local grocery store [$CND 0.09 (1990) for 57 L bag and $CND 0.11 (1990) for 114 L bag)].
- Residents must purchase special disposal tags for tires and appliances [$CND 5.10 for appliances; $CND 2.50 for car-size tires; $CND 4.75 for light truck tires; $CND 15.25 for heavy truck tires; and $CND 15.25 to $CND 22.90 for tractor tires] with the fees used to cover the City's costs to dispose or recycle these items.
- Dry recyclables are separated into a set of 3 stackable 57 L containers (one bin for ONP, one bin for plastic containers, and the third bin for co-mingled glass and metal), mixed paper is set out in clear plastic bags and OCC set out next to bins.
- 2 workers collect dry recyclables, once every 2 weeks, using a used beer/pop truck with 10 bins and 4 shelves (2 bins each for cans, mixed paper, ONP, glass and plastics) with each glass bin further divided for the 3 colours of glass.
- Commercial and Institutional OCC is collected 4 times/week using same compactor truck used for refuse collection.
- A drop-off centre is also available at the City's Recycle Centre for all residents, businesses and institutions which collects an estimated 2.9 tonnes or 1% of total tonnage reported for dry recyclables.
- Dry recyclables are taken to the City's materials processing centre (Recycle Centre) and processed as follows:
  - OCC, mixed paper and plastic are baled.
  - ONP is shredded and baled.
  - Glass is crushed.
- All materials are stored in an old renovated barn (glass stored for 4 months, tin for 3 months, OCC for 2-4 months, mixed paper for 2-4 months, and plastic up to one year).
- Yard wastes (leaves and wood waste) are set out at curb.

Specific Features (Cont'd)	- A City dump truck with a two person crew collects yards wastes with leaves wetted to make collection easier. - Leaves and wood waste taken to City's compost site, located on closed landfill. - Leaves, garden waste, and small amount of food waste placed in large windrows which are turned 1-2 times weekly by one person with a front end loader. - Compost is used by City for landscaping projects. - Brush is also taken to compost site where it is burned.
Waste Types and Sources	- Residential and commercial/institutional waste streams targeted. - Glass containers, tin, aluminum, PET and HDPE plastic beverage, detergent, motor oil containers, ONP, OCC, mixed paper, appliances and high grade paper from Com/Inst. - Leaves and wood waste.
Operational Responsibility	City of Fennimore is responsible for collection, processing and disposal of all commercial and residential wastes generated in the City including hauling wastes to Cuba City transfer station.
Contractual Arrangements	There is an arrangement with private hauler to ship Fennimore's waste to a landfill in Delavan from the transfer station in Cuba City.
Role/ Requirements of Resident, Private/ Public Sectors	- Separate materials into 3 stackable bins. - Place mixed paper in clear plastic bags and OCC next to bins. - Special clear plastic bags must be purchased for all non-recyclable waste. - Brush and wood wastes are piled at curb and leaves are set out loose. - Residents tend to leave grass clippings on their lawns with at least 1/3 of all residents having backyard composting areas.
Public Education/ Promotion/ Training	- Utility bill mailings used to distribute recycling information fliers. - Programs developed for school children. - Periodic open houses held at the Recycle Centre. - The City writes newspaper articles and makes radio announcements pertaining to recycling program.
Material Flow/ Handling Methods	- Recyclables are source separated (single and multi-unit residences, businesses and institutions) and placed at curbside or in alley for collection. - A public drop-off centre is also available at the City's Recycle Centre for all businesses, institutions and residents. - All dry recyclables are sent to City's materials processing centre with little to no residual due to quality of materials collected and sorted at curbside. - The City picks up leaves and wood wastes and delivers them to compost site on land that previously served as the City's landfill. - Residents with grass clippings and small yard trimmings are asked to either leave them on their lawns, compost them at home or haul materials to designated compost site.

Residue Management

No materials rejected at materials processing centre or compost site due to the high quality of materials collected at curbside.

Key Issues in Municipal/ Resident Acceptance

- The strong community oriented nature of residents combined with mandatory recycling legislation creates a 100% participation rate with no economic incentives to residents offered.
- Businesses that have large quantities of waste have less frequent refuse pick up because lower collection fees, and by recycling some businesses have reduced their refuse rates through recycling.

Applicability to North/South, Urban/Rural

Highly applicable to rural communities provided a strong sense of community exists.

Multi-Unit Applicability

- System incorporates all 96 multi-unit dwellings with 4 - 12 units each with similar curbside collection and source separation.
- Limited applicability of collection method for larger multi-unit dwellings such as apartments and condominiums.

Implications for Other Aspects of Waste Management System

Successful high diversion rate of 38% of total municipal solid waste reduces the quantity sent to landfill.

Financing and Economics

Capital Costs

- For collection:
  - Recycling: $CND 46,700 in 1989; for beer/pop collection
  - Composting: $CND 38,100 in 1989; for dump truck @ 10% of use construction of bins for truck, painting truck and 1,300 sets of stackable curbside bins
- For processing:
  - Recycling: $CND 900 in 1988; for newsprint baler
    $CND 103,200 in 1989; for forklift, skid loader, cardboard baler, paper shredder, glass crusher and building/remodelling
    $CND 12,300 in 1990; for storage barn remodelling
  - Composting: $CND 46,700 in 1975; for Front end loader used 1% of the time for turning compost.

Operating Costs

- Recycling (1990)
  - $CND 15,900/yr for collection
  - $CND 33,850/yr for processing
  - $CND 650/yr for education/ publicity
- Composting (1990)
  - $CND 12,900/yr for collection
  - $CND 2,800/yr for processing
- Total Operating Cost - $CND 66,100/yr

Administrative Costs

Total Administrative Costs $CND 900/yr

Revenues

- Revenues generated in 1990 for sale of materials: $CND 9,410.
- The City receives revenues for all materials except low-grade mixed paper (junk mail, catalogues, magazines, and paperboard boxes).
- Materials are stored in an old renovated barn until they are marketed (glass for 4 months, tin for 3 months, OCC for 2 - 4 months, mixed paper 2 - 4 months, and plastic for up to 1 year).

End Market Information

- ONP shredded and baled for use as bedding by local farmers sold at $CND 1.27 (1990) per bale.
- Appliances are given to junk dealer for salvage of parts.
- Crushed glass and metals delivered to markets in Dubuque, Iowa.
- Plastic company in Wisconsin picks up baled plastic from Recycle Centre and processes it into corrugated drain tile.
- Paper processing company picks up baled corrugated cardboard and mixed paper.

Financing Arrangements/ Issues

Recycling and composting programs funded through State grant and local taxes.

Contractual Arrangements

Private hauler ships Fennimore's waste to landfill in Delavan, Wisconsin from the transfer station in Cuba City, Wisconsin.

Performance

Material Quantities/ Capacity

- MSW recycled (1990):

Material	Residential (tonnes)	Commercial/ Institutional (tonnes)	Total (tonnes)
ONP	31	2	22
OCC	5	93	98
Mixed paper	80	14	94
Glass	13	20	33
PET & HDPE	8	6	14
Aluminium Cans	0.4	0	0.4
Ferrous Cans	10	10	20
Total	147.4	145	292.4

- MSW Composted (1990), residential only:

Material	Amount (tonnes)
Leaves	96
Grass/Garden Waste/Food Waste	57
Total	153

Unit Capital Costs

The City of Fennimore paid for all equipment in full at the time of purchase with City taxes.

Unit Operating Costs

- Recycling - $CND 175/tonne
- Composting - $CND 102/tonne

Durability/ Downtime

System is dependable and meets the service needs of the community.

Waste Diversion Impact	- 445 tonnes total - 292 tonnes recycled, 153 tonnes composted (1990) - 445 tonnes/2,378 pop = 187 kg/cap/yr (1990) includes commercial and institutional waste
Observed/ Measured Impact on 3R Awareness, Participation	- Participation rate of 100% for residential. - 100 of 105 business/institutions participate (5 do not produce recyclable materials).
Labour Requirements	- Full time - Recycling Coordinator. - Part time - 1 employee works in processing. - 2 City employees on Mondays for collection. - 1 employee @ 2 hrs/wk to turn compost piles.
Employee Health & Safety Issues	Safety meetings are held periodically by Public Works Department for City employees.

Design and Siting Requirements/Issues

Stakeholder Roles	City if responsible for: - Operating curbside collection program (wet and dry recyclables), composting facility, drop-off centre, Recycle Centre. - Funding of haulage of refuse through a private hauler to transfer station in Cuba City, Wisconsin. City residents are responsible for: - Source separating recyclables for curbside collection. - Purchase of clear plastic bags or special disposal tags. State: - Provides funds to the Responsible Unit (Grant County) to assist with costs of establishing a system that concentrates on waste reduction, reuse and/or recycling to meet 1995 bans; or directs yard wastes away from landfills to meet 1993 bans. County: - Administers State funding.
Approvals Process, Timing Costs	Licence was required to operate the composting facility.
Environmental Issues	Information requested but not provided or available.
Conditions of Approval	The operation of the composting facility requires the City to monitor odours and other nuisances.
Reporting Requirements	Odour control logs must be reported on a regular basis.

Regulatory and Operating Environment

Government Regulations/ Standards

Wisconsin Act 335:

- A recycling law established in 1990 to reduce the more than 5.4 M tonnes of waste sent to landfill or incineration.
- The law reaffirms the states commitment to reduce waste volume following this list of prioritized items:
  1. Reduce.
  2. Reuse.
  3. Recycle.
  4. Compost.
  5. Incinerate with energy recovery.
  6. Dispose on land.
  7. Incinerate without energy recovery.
- Beginning in 1995 access to landfills and incinerators will be permitted only to those communities that recycle and meet criteria for effective recycling program.
- Schedule of items banned from landfills and/or incinerators:

  Effective January 1, 1990:
  - lead acid batteries
  - major appliances
  - waste oil

  Effective January 1, 1993:
  - No landfilling or incinerating of yard wastes at any facility that does not practice energy recovery.

  Effective January 1, 1995:

  The following items cannot be landfilled, converted to fuel or incinerated:
  - aluminum containers
  - corrugated paper and other container board
  - foam polystyrene
  - glass containers
  - magazines
  - newspapers
  - office paper
  - plastic containers
  - steel containers
  - waste tires
  - bi-metal steel/aluminum containers

Contacts

Governmental

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Research References

Literature Sources

Beyond 40 percent: Record Setting Recycling and Composting Programs. Institute for Local Self Reliance.

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Personal Communications

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10.0 SYSTEMS

10.2 Rural Communities Achieving High Diversion

10.2.2 Rural Communities Achieving High Diversion with Focus on Community Involvement

General Overview

Not all examples of exceptional municipal waste diversion levels have involved particularly sophisticated programs or technologies. An alternate means of achieving high diversion has been to cultivate a superior degree of involvement from residents. Cases such as that of Wilton, Wisconsin demonstrate the high levels of community interest, participation and waste diversion which can be achieved when residents assume a personal stake in addressing waste management issues.

Since 1988, curbside collection of recyclables in Wilton has been provided by volunteer crews. Twice a month, the volunteers, drawn from a list of 40 to 50 interested residents, have collected and sorted materials for recycling. Unfortunately, after ***five years*** of successful operation, the program was cancelled in early 1993 due to declining volunteer interest and has been replaced by a drop-off depot. Regardless, this case study provides an excellent example of the type of initiative that can be undertaken with strong community focus and involvement.

Case Study / Subject Jurisdiction:

Wilton, Wisconsin

Demographics

Community Type:	Rural		Land Area:	8 sq. mi.
Population:	473		Population Served:	473
Households:	200		Households Served:	200
Total Residential Waste:		182t	Number of Businesses:	9
Total Commercial Waste:		24t		

- Small village located in a dairy farming area.
- Population, number of households and tonnage of waste generated stayed at the same level as reported through all 5 years of the program.
- Roughly 30% of population is made up of retired seniors and widows.
- Village largely made up of extended families (i.e. most have a large number of relatives living in same area); there are very few single residents.

Political/ Social Factors

- Mandatory State recycling legislation implemented in 1992 describing a 5 year phased schedule of materials banned from refuse collection.

Driving Forces

- Recycling implemented after Monroe County landfill abandoned a flat fee system for refuse disposal in favour of $CND 43/tonne tip fee.
- Local entrepreneur provided curbside pick-up of recyclables through July and August 1988 free in exchange for revenue from material collected, but dropped Village from his route after two months as he was over-extended in trying to service Wilton plus four other towns. As immediate solution, Village President decided to round up some volunteers to provide collections.
- After initial success, Village decided to continue volunteer operation of recycling program.
- Decline in volunteer help and donation of a roll-off container prompted cancellation of program.

Detailed Description

- System relies heavily on exceptional participation of residents.
- High degree of source separation required at curb.
- Curbside waste collection provided by private hauler.
- Waste disposed of at County of Monroe owned landfill.
- Effort entirely driven by volunteer initiative of 2 or 3 board members, financially backed by the Village Board.
- Residents initially called by volunteer board members and asked to participate in collection; if response was positive the resident's name was added to a volunteer list.

Specific Features

- Volunteer recycling program in operation from 1988 to 1993.
- Recyclables collected at curbside second and fourth Saturday of every month.
- Volunteer crews of 4 to 5 collect and sort material using village owned dump truck to pull a trailer with frame rack for recycling.
- One volunteer drives, two collect the materials at curbside.
- Materials are manually sorted, by two crew members, into 208 L barrels on the trailer as they are collected.
- Collection takes from 8 am to 12 noon to complete.
- Volunteers drawn from a list of 40 to 50 regular participants.
- Village collects corrugated cardboard from all 5 businesses; collection done on volunteer basis by board member.
- Village staff person picks up glass and aluminum on weekly basis from Taverns, material is stored with other recyclables until transported to processing facility.
- Yard waste collected separately, using dump truck, once per week and spread over farm land owned by the Village.

Waste Types and Sources

- Residential and commercial waste streams targeted.
- Glass; rigid plastic containers milk jugs, beverage containers, shampoo and detergent bottles); film plastics (bread wrappers, saran wrap, milk and shopping bags); ferrous; aluminum; corrugated cardboard; newspaper; magazines.
- Leaves; grass clippings; other wood waste from residential.

Operational Responsibility

Operated at the municipal level on a volunteer basis.

Role/ Requirements of Resident, Private/ Public Sectors	- Separate materials at curb and place in a cardboard box, plastic grocery bags or some other reusable containers. - Each colour of glass placed in own grocery bag. - Aluminum, and ferrous must be sorted into separate bags. - Bundle newspaper and magazines. - String together plastic bottles with handles. - Film and other plastic placed in separate grocery bag. - Grass and leaves must be bagged; brush and wood, bundled. - Separation of recyclables is voluntary, yard waste - mandatory. - Village staff person responsible for collection of yard wastes. - Village board member acts as recycling crew leader on a voluntary basis. - Residents tend to leave grass clippings on their lawns rather than raking and bagging, and burn their leaves in Fall in backyard barrels.
Public Education/ Promotion/ Training	- Newsletter is sent to residents to urge participation in the program. - Newsletter describes what to sort and place at curb as well as explaining the financial impact on village funds due to non-participation. - Sewer and water bill mailings used to distribute newsletter to residents. - A recycling guide has been distributed by the Village to residents. - Reminders are occasionally printed in the local shopping guide. - Public education by example - residents encouraged to participate by example set by volunteer effort of fellow residents and council members. - Residents who volunteer for recycling crew learn first hand the need for and importance of proper sorting of recyclables. - Non-recyclable or improperly sorted material left at curb. - Village president, on volunteer basis, provides information to interested residents. - Notices posted in common village areas i.e. post office, bank, hardware store. - Village requires local schools to teach recycling to grades kindergarten to 8. - Students are taken on field trip to processing facility.
Public Education/ Promotion/ Training (Cont'd)	- Curbside pick-up of materials has been strong incentive to participate (waste diversion levels have reportedly dropped to 25% since curbside collections were ceased in favour of current drop-off depot).
Material Flow/ Handling Methods	- Recyclables source separated and placed at curbside for collection. - Materials stored in a small donated building in collection barrels from trailer until hauled to processor by village volunteers. - Barrels loaded on and off truck manually with help of volunteers. - Initially metal barrels were used but found to be too heavy. - Plastic 208 L barrels with handles cut into the sides are used. - Wood waste collected from residents is burned at village owned farm.

Residue Management

- Residue consists of contaminants sorted out manually by collection volunteers and placed into a separate refuse barrel on the recycling rack.
- Material that is excessively contaminated, improperly sorted or presents a handling hazard (i.e. broken glass) is left at the curb; the resident is contacted to explain why.
- Level of contamination is 5% (estimated by crew leader).
- All residue landfilled.

Key Issues in Municipal/ Resident Acceptance

- Tightly knit community where everyone knows everyone else.
- No difficulty in recruiting volunteer crews as endeavour is seen as lighthearted and enjoyable.
- Strong sense of community pride; resultant peer pressure.
- Most volunteers already involved in other volunteer work.
- System efficiency not a significant concern.
- Residents not asked to do anything that council members are not doing themselves.
- No formal incentive program for volunteers; informal social activities (lunch afterwards, beer bought by crew leader or supportive residents) helped to maintain level of enjoyment and sense of belonging to a unique group.

Applicability to North/South, Urban/Rural

- Highly applicable to rural, whether north or south, provided a strong sense of community exists.
- Less applicable in urban areas due to scale of volunteer efforts which would be required; possible applications for specific programs if accompanied by intensive promotion and strong community outreach.

Multi-Unit Applicability

- Use of voluntary collection and sorting crews may be applicable in a multi-unit dwelling.
- System, as a whole, does not apply.

Implications for Other Aspects of Waste Management System

- Since tipping fees at the County landfill are tonnage based, diversion efforts reduce cost to the Village for waste disposal.
- Private hauler who provides curbside collection of wastes originally also hauled recyclables from storage site to processor at no charge, but was to begin charging $CND 56/tonne as quantities increased, as of May, 1990.
- Haulage, since May 1990, provided by volunteers who would drive the truck to the processor when sufficient quantities of material had accumulated.

Financing and Economics

Capital Costs

- Village dump truck purchased in 1970; cost to program $0 since cost of vehicle has long since been depreciated.
- Trailer and frame rack (for recycling) - $CND 381 in 1989.
- Collection barrels donated.

Operating Costs	Recycling	- $CND 254/yr (cost of gas and oil for truck). - storage building costs - $0 (donated).
	Composting	- $CND 152.5 for gas and oil. - $CND 331 labour (1 hr/wk x $CND 6.35/hr).
Administrative Costs		- None - all administrative work is done on volunteer time. - Cost of paper used for newsletters, mailers and postings absorbed by Village administration. - Postage for mailings already paid by sewer and water utility billings.
Revenues		None received - processor keeps revenue from sale of recyclable material.
End Market Information		Responsibility of processor to secure markets.
Financing Arrangements/ Issues		- Collection, haul and disposal costs paid out of taxes. - "Responsible Units" receive State funding to pay for the processing of recyclables collected from communities within a defined geographic area. - Monroe County, which encompasses the Village of Wilton, is a "Responsible Unit". - Processor keeps revenue from sale of recyclables.
Contractual Arrangements		- Contract with refuse hauler negotiated every 3 to 5 years. - Village pays flat fee of $CND 159/week to hauler for curbside waste pick-up.

Performance

Material Quantities/ Capacity	Capacity limits of existing system not established.
Overall Unit Cost	$CND 737/82 tonnes = $CND 9/tonne; /473 pop. = $CND 1.56/cap./yr. (1989).
Unit Capital Costs	Information requested but not provided or available.
Unit Operating Costs	Information requested but not provided or available.
Waste Diversion Impact	- 82 tonnes total - 9 tonnes composted, 73 tonnes recycled (1989). - 82 tonnes/473 pop. = 173 kg/cap/yr (1989).
Observed/ Measured Impact on 3R Awareness, Participation	- Participation rate 50 - 60% (as estimated by Crew Leader). - Recycling program judged by Village to have greatly raised awareness of solid waste issues and the importance of source separation/ recycling. - At end of program participation had dropped to 40 - 45%.
Labour Requirements	- Recycling - 5 people/crew x 26 weeks. - Composting - 1 hr/week x 52 weeks.
Labour Skills Required	Low.

Net Employment Impact	- 1 hr/week for village employee who collects yard waste. - No additional employment.
Employee Health & Safety Issues	- Village insurance carrier informed of volunteer program, no increase in premium was required. - Volunteers requested to wear old clothing and gloves.

Design and Siting Requirements/Issues

Stakeholder Roles	Village is responsible for: - providing village employee to collect leaves and yard wastes; - board member handles scheduling of volunteer recycling crews; - funding of haulage of recyclables to processor, waste collection and disposal through Village budget. Village residents: - volunteer time to run program. State: - provides funds to the Responsible Unit (Monroe County) to pay for processing of recyclables. County: - administers State funding.
Approvals Process, Timing Costs	Effort entirely driven by volunteer initiative of 2 or 3 board members, financially backed and supported by the Village Board.
Conditions of Approval	No approvals required; State provides funding for costs related to processing, but not collections.
Reporting Requirements	No specific reporting requirements.

Contacts

Governmental	Nalani Bever, Village President Village of Wilton P.O Box 70 Wilton, Wisconsin 54670 (608) 435-6666 Fax (608) 372-5492

Research References

Literature Sources	Beyond 40 Percent: Record Setting Recycling and Composting Programs Institute for Local Self Reliance.
Personal Communications	Nalani Bever, President, Village of Wilton Tel: (608) 435-6666

Section 11

Updating Mechanisms for This Guide

11.0 UPDATING MECHANISMS FOR THIS GUIDE

This Guide provides data which are current at the time of preparation during the summer of 1993. To ensure that it remains a useful and relevant document, case study data may be updated or additional case studies added.

Information has been presented in order to facilitate updating and expansion of the Guide through use of:

- section and sub-section titles which reflect commonly used categories of 3R activities,
- autonomous case studies within each section, and
- page numbering by sub-section.

As a result, existing case studies can be updated by:

- replacing the existing case study with a more complete or more up-to-date version, or
- inserting an addendum of supplementary information immediately after the existing case study, following the page numbering in that sub-section.

The Guide can be expanded by:

- inserting additional case studies, prepared using similar format, within the appropriate sections, and
- revising the Table of Contents to reflect additional sub-sections.

Appendix A

Long List of Candidate Components

1.0 SOURCE REDUCTION PROGRAMS	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
1.1 Approaches - Residential											
a) Programs to change purchasing habits to buy in bulk and/or products with less packaging	medium	medium	high	medium	high	medium	medium	high	yes	yes	yes
b) Retail outlets selling used items	low	high	high	high	high	low	medium	medium	yes	yes	no
c) Repair services	low	high	high	high	high	low	medium	medium	yes	yes	no
d) Programs to encourage people to leave grass clippings on the lawn instead of bagging them for pickup	medium	high	high	high	high	low	medium	high	yes	yes	yes
1.2 Approaches - IC&I											
a) Manufacturing reduction initiatives e.g. lightweighting	medium	medium	high	medium	medium	medium	medium	medium	yes	yes	yes
b) Programs to encourage source reduction in the workplace e.g. change procurement practices to buy in bulk and/or with less packaging	high	medium	high	medium	high	medium	medium	high	yes	yes	yes

2.0 BACKYARD COMPOSTING	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
2.1 Technology											
a) Backyard composters	medium	high	high	high	high	low	high	high	yes	yes	no
b) Vermicomposters	medium	high	medium	high	high	medium	high	high	yes	yes	no
c) Backyard digesters for food waste including proteins e.g. meat scraps	medium	high	high	high	high	low	high	high	yes	yes	no
2.2 Communication/Sustainability											
a) Block Leader Programs to provide on-going support for backyard composting activities	medium	high	high	high	high	high	high	high	yes	yes	yes
b) Green Community information programs	medium	high	high	medium	high	high	high	high	yes	yes	yes
c) Master Composter Training Programs: training of interested individuals and a requirement for volunteer community time	medium	high	high	high	high	high	high	high	yes	yes	no
2.3 Program Evaluation											
a) Review of municipal backyard composting programs to determine actual and potential waste diversion	medium	high	high	high	high	high	high	high	yes	yes	yes

3.0 ON-SITE MID-SCALE COMPOSTING	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
3.1 Technology											
a) Composting units with capacities from 25 - 100 lbs/day	medium	high	high	high	medium	medium	medium	high	yes	yes	no
b) Composting units with capacities from 100 to 500 lbs/day	high	high	high	low	medium	high	medium	medium	yes	yes	yes
3.2 Implementation - Residential											
a) Community Composting: single sites serving from 3-30 households	medium	high	high	high	medium	high	high	high	yes	yes	yes
b) Community Composting: single sites serving from 30-200 households	medium	high	high	high	medium	high	high	high	yes	yes	yes

3.0 ON-SITE MID-SCALE COMPOSTING (con't)	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
3.3 Implementation - IC&I											
a) Schools	medium	high	high	high	medium	medium	high	high	yes	yes	yes
b) Health care facilities	medium	medium	high	medium	medium	high	high	medium	limited	yes	yes
c) Cafeteria/lunch rooms/restaurants	medium	medium	high	medium	medium	high	high	medium	limited	yes	yes
d) High moisture food industry residuals	medium	medium	medium	high	medium	medium	medium	low	yes	yes	yes
e) Co-composting of farm manure and food processing waste	medium	high	medium	high	medium	medium	medium	low	yes	yes	yes

4.0 REUSE PROGRAMS	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
4.1 Approaches - Residential											
a) Repair and salvage facilities established at landfill sites	low	high	medium	medium	medium	medium	medium	low	yes	yes	yes
b) Waste exchange warehouses and depots for reusable items	medium	medium	medium	high	medium	low	medium	low	yes	yes	yes
c) Diversion of reusable construction materials from landfill to non-profit agencies	medium	high	medium	high	high	high	medium	medium	yes	yes	yes
d) Reuse of HHW through redistribution at depots	low	high	high	low	low	medium	medium	medium	yes	yes	yes
e) Replace shopping bags with reusable green plastic boxes	low	medium	high	medium	medium	medium	medium	medium	yes	yes	no
f) Salvage days - scavenging encouraged during annual setout of extra waste items	medium	high	high	high	medium	high	high	high	yes	yes	yes

4.0 REUSE PROGRAMS (con't)	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
4.2 Approaches - IC&I											
a) Collection of surplus perishable food using refrigerated trucks for direct distribution	low	medium	low	medium	medium	high	medium	medium	yes	yes	yes
b) Reuse of refillable plastic beverage bottles	medium	medium	high	medium	medium	medium	low	medium	yes	yes	no
c) Collection and retailing facility for construction and renovation waste	medium	medium	medium	medium	medium	medium	medium	low	yes	yes	yes
d) Reusable tote system for bulk delivery of materials	medium	high	medium	high	medium	low	low	low	yes	yes	yes
e) Waste exchanges operated on a regional, provincial and/or federal basis	medium	high	medium	high	high	high	high	medium	yes	yes	yes
f) Reuse of cardboard boxes through arrangement with suppliers	medium	high	medium	medium	high	medium	medium	low	yes	yes	yes
g) Two-way envelopes	low	high	high	low	high	high	medium	medium	yes	yes	yes
h) Use of "refill bars" to encourage customer refill of containers	medium	high	high	medium	medium	high	medium	medium	yes	yes	yes

5.0 CURBSIDE COLLECTION OF RECYCLABLES	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
5.1 Traditional Blue Box Programs											
a) Programs that include ONP, clear & coloured glass, PET, ferrous and non ferrous metals									yes	yes	no
5.2 Expanded Blue Box Programs											
a) Addition of PS (pilot indicates 83% recovery)	low	medium	medium	low	medium	medium	medium	medium	yes	yes	no
b) Addition of Al foil & plates	low	medium	medium	low	medium	medium	medium	medium	yes	yes	no
c) Use of Blue Bag for collection of plastics	medium	medium	high	medium	medium	medium	medium	medium	yes	yes	no
d) All materials sorted at curb to eliminate need for MRF	medium	medium	medium	medium	medium	medium	medium	medium	yes	yes	no
5.3 Bag Based Programs											
a) Used as an alternative to Blue Box	medium	medium	high	medium	medium	medium	medium	medium	yes	yes	yes
a) Used to accommodate co-collection with waste	medium	high	high	medium	medium	medium	high	low	yes	yes	yes

5.0 CURBSIDE COLLECTION OF RECYCLABLES (con't)	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
5.4 Bucket Based Programs											
a) Used to increase convenience and presorting	medium	high	high	medium	medium	low	high	medium	yes	yes	yes
5.5 Special Collections											
a) Addition of materials e.g. used oil, car batteries, textiles, mixed paper	high	low	high	medium	medium	medium	medium	medium	yes	yes	no
5.6 Co-collection											
a) Collection of multiple streams using one vehicle e.g. recyclables with waste and/or organics	high	high	high	medium	medium	medium	medium	low	yes	yes	yes
5.7 Truck Technologies/Design											
a) Review of existing/ emerging truck options e.g. combination of compactor/ recycling vehicle			high	low	medium	medium	medium	low	yes	yes	yes

6.0 DEPOT COLLECTION OF RECYCLABLES	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
6.1 Technology											
a) Comparison of carts, rolloffs, customized containers	medium	high	high	medium	medium	medium	medium	medium	yes	yes	no
6.2 Implementation - Urban											
a) As an alternative to curbside collection	medium	high	medium	medium	medium	medium	medium	medium	yes	yes	yes
b) Strategically located to serve households without curbside collection	medium	high	medium	medium	medium	medium	medium	medium	yes	yes	yes
c) Education and training programs for apartment recycling co-ordinators	medium	high	medium	high	high	high	high	medium	yes	yes	no
d) Depots in conjunction with a Block Leader program	medium	high	medium	high	high	high	high	medium	yes	yes	yes
e) Use of retail outlets as depots for HHW products e.g. batteries, paint	medium	high	high	high	medium	medium	medium	medium	yes	yes	yes
f) Use of postal system for return of used tetra-brik carton using Oko-box	low	medium	high	high	medium	high	high	medium	yes	yes	no

6.0 DEPOT COLLECTION OF RECYCLABLES (con't)	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
6.3 Implementation - Rural											
a) As an alternative to curbside collection	medium	high	medium	medium	medium	medium	medium	medium	yes	yes	yes
b) Strategically located to serve households without curbside collection	medium	high	medium	medium	medium	low	medium	medium	yes	yes	yes
c) Depots in conjunction with a Block Leader program	medium	high	medium	high	high	high	medium	high	yes	yes	yes
d) Use of retail outlets as depots for HHW products e.g. batteries, paint	medium	high	high	low	medium	medium	medium	medium	yes	yes	yes
e) Use of postal system for return of used tetra-brik carton using Oko-box	low	medium	high	medium	medium	high	high	medium	yes	yes	no
6.4 Buy Back Centres											
a) Financial rewards to encourage use of depots	low	medium	medium	high	medium	low	high	medium	yes	yes	no

7.0 CURBSIDE COLLECTION OF ORGANICS	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
7.1 Plastic Bag Programs											
a) Use of plastic bags for containerization and curbside collection of organics	high	medium	high	low	medium	medium	medium	medium	yes	yes	yes
7.2 Paper Bag Programs											
a) Use of paper bags for containerization and curbside collection of organics	high	medium	high	medium	medium	medium	medium	medium	yes	yes	yes
7.3 Rollout Cart Programs											
a) Use of carts for collection of organic wastes	high	medium	medium	medium	high	high	high	medium	yes	yes	yes

8.0 DEPOT COLLECTION OF ORGANICS	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
8.1 Rollout Cart Programs											
a) Carts used as centralized dropoff and collection point	high	high	high	medium	medium	medium	high	high	limited	yes	yes
8.2 Urban Depots with Transfer of Organics											
a) Dropoff depots for leaves, grass and brush	high	high	medium	medium	medium	medium	high	medium	limited	yes	yes
b) Dropoff depots for spoiled dry foods e.g. bread, pasta, flour	medium	high	medium	medium	medium	medium	high	medium	limited	yes	yes
8.3 Rural Depots with Composting of Organics											
a) Dropoff sites for leaves, grass and brush	high	high	medium	high	medium	medium	high	high	yes	yes	no

9.0 TRANSFER OF RECYCLABLES AND ORGANICS	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
9.1 Transfer of Recyclables - Urban											
a) Transfer of relatively large quantities from collection area to centralized MRF	high	high	medium	high	medium	medium	high	low	yes	yes	yes
9.2 Transfer of Recyclables - Rural											
a) Transfer of relatively small quantities from collection area to centralized MRF	medium	high	medium	high	medium	medium	high	low	yes	yes	yes
9.3 Transfer of Organics - Urban											
a) Transfer of relatively large quantities from collection area to centralized composting facility	high	high	medium	medium	medium	medium	high	low	limited	yes	yes
9.3 Transfer of Organics - Rural											
a) Transfer of relatively small quantities from collection area to centralized composting facility	medium	high	medium	medium	medium	medium	high	low	limited	yes	yes

10.0 PROCESSING OF RECYCLABLES	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
10.1 High Manual/Low Automation											
a) Use of predominantly manual sorting and handling		medium	high	high	medium	low	high		yes	yes	no
10.2 Medium Manual/Medium Automation											
a) Use of a blend of manual and automated sorting and handling		medium	medium	high	medium	low	medium		yes	yes	no
10.3 Low Manual/High Automation											
a) Use of predominantly automated sorting and handling		medium	medium	medium	medium	medium	medium		yes	yes	yes
10.4 Mobile MRFs											
a) Mobile processing equipment for use on "as needed basis" or to be shared by communities		medium	medium	medium	medium	high	high		yes	yes	yes
10.5 Mini MRFs											
a) Processing systems with capacity up to 50 tpd for use in rural areas and on-site commercial facilities e.g. malls		medium	high	medium	medium	high	high		yes	yes	yes

10.0 PROCESSING OF RECYCLABLES (con't)	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
10.6 Other											
a) Learning centres associated with MRF's e.g. mall mini MRF, municipal MRF			high	high		high	high	high	yes	yes	yes
b) Location of MRF operation in abandoned quarries and mines to reduce environmental impacts and allow stockpiling of material		medium	medium	medium	medium	high	medium		yes	yes	no
c) Colour coating of clear glass which would eliminate handling of coloured glass containers	medium	high	high	medium	medium	high	high	low	yes	yes	no
d) Animal farming associated with MRF operation for consumption of food waste	medium	medium	medium	medium	medium	high	high	low	yes	yes	no
e) Automated MRFs for processing up to 500 tpd of C&D wastes	high	medium	medium	high	medium	high	high	medium	yes	yes	yes

11.0 PROCESSING OF ORGANICS	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
11.1 Composting											
a) Share mobile yard waste processing equipment by rural communities		high	medium	high	medium	high	high	low	yes	yes	no
b) Enclosed fabric domed windrow composting facility		medium	high	medium	medium	medium	medium	low	yes	yes	no
c) Co-composting of municipal sewage sludge with yard waste, newspaper, OCC and mixed paper, food waste	high	medium	high	high	medium	medium	medium	low	yes	yes	yes
d) Delivery of compost to community gardens, farms, others		medium	medium	high	medium	medium	high	medium	yes	yes	no
e) Application of mushroom composting technology to organic waste composting		medium	medium	high	high	medium	medium	low	yes	yes	no
f) Yard waste composting facility design emphasizes minimum environmental impact through use of roofed building with open sides to accommodate location in an environmentally sensitive area		medium	high	medium	high	medium	medium	low	yes	yes	no

11.0 PROCESSING OF ORGANICS (con't)	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
11.2 Digestion											
a) Biogas facilities	high	medium	high	medium	medium	high	medium	low	yes	yes	yes
b) Conversion of organic waste to ethanol fuel	high	medium	high	medium	medium	high	medium	low	yes	yes	yes
11.3 Other/Non-degradation											
a) Land application of selected organic wastes	medium	high	medium	medium	medium	medium	high	low	yes	yes	no
b) Processing of organic wastes into animal feed	medium	medium	medium	medium	medium	medium	high	low	yes	yes	no
c) Waste exchange to direct selected organic wastes to animal feed	medium	high	medium	medium	medium	medium	high	medium	yes	yes	no
d) In-sink garburetors to direct organic waste for disposal through sewage treatment system	medium	medium	medium	high	medium	medium	medium	medium	yes	yes	yes

12.0 MANAGEMENT OF HHW	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
12.1 Collection Approaches											
a) Permanent dropoff depots	low	medium	high	high	high	low	medium	medium	yes	yes	no
b) Temporary dropoff depots: one day or weekend events	low	medium	high	high	high	low	high	medium	yes	yes	no
c) Return of certain items e.g. unused medicines, batteries to point of sale	low	medium	high	medium	high	medium	medium	medium	yes	yes	yes
d) Drop boxes for the collection of household batteries	low	medium	high	high	high	medium	medium	medium	yes	yes	no
f) Mobile depots which can be moved from location to location	low	low	high	medium	high	medium	medium	medium	yes	yes	yes
h) Curbside collection of batteries in separate plastic bag and set out with recyclables	low	medium	high	medium	high	medium	medium	medium	yes	yes	yes
i) Curbside collection of range of HHW using designated vehicle	low	low	high	medium	high	high	low	medium	yes	yes	yes
j) Collection by request	low	low	high	medium	high	high	medium	low	yes	yes	no

12.0 MANAGEMENT OF HHW (con't)	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
12.2 Communication/Sustainability											
a) Community based action plan to reduce use of HHW	low	high	high	medium	high	high	medium	high	yes	yes	yes
b) Green Community information programs	low	high	high	medium	high	high	high	high	yes	yes	yes
c) Block Leader program to provide ready access to information on alternatives and disposal of HHW	low	medium	high	medium	high	high	high	medium	limited	yes	yes
12.3 Evaluation											
a) Review of municipal HHW programs to determine actual and potential waste diversion	low	medium	high	medium	high	low	medium	medium	yes	yes	yes

13.0 ECONOMIC INSTRUMENTS AND MECHANISMS	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
13.1 User Fees											
a) Volume based fees	high	high	high	high		medium	medium	high	yes	yes	yes
b) Weight based fees	high	medium	high	medium		medium	medium	high	yes	yes	yes
13.2 Contract Performance	medium	high	medium	medium		medium	medium	low	yes	yes	no
13.3 Diversion Credits	medium	medium	medium	medium		medium	high	low	yes	yes	no
13.4 Tipping Fees	high	high	high	high		medium	high	high	yes	yes	yes
13.5 Incentives											
a) Property tax rebate	medium		high	low		medium	medium	medium	yes	yes	no
b) Rebate on utility bill based on revenue from recyclables	medium	medium	medium	low		medium	medium	medium	yes	yes	yes
c) Other rewards e.g. prizes	medium		high			medium	medium	medium	yes	yes	yes
13.6 Other											
a) Low interest loans	medium		high			medium	medium	medium	yes	yes	no

14.0	RESTRICTIONS AND REGULATIONS	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
14.1	Packaging Bylaw (at the municipal level)	low		high	low	high	medium	medium	medium	yes	yes	yes
14.2	Curbside Volume Limit	medium	high	medium	medium	high	medium	medium	high	yes	yes	yes
14.3	Mandatory Participation	medium	high	medium	medium	high	medium	medium	medium	yes	yes	no
14.4	Facility Operating Requirements e.g. odour unit requirements at various distances from a composting plant			high	medium	high	high	medium	low	yes	yes	yes
14.5	Material Disposal Bans	high	high	high	high	medium	medium	high	high	yes	yes	no
14.6	Province Wide Variable Rate Requirement	medium	medium	high	low	high	high	medium	high	yes	yes	no

15.0	3R SYSTEMS	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
15.1	**Urban Community Achieving 40% Diversion (e.g. Seattle, WA; Lemsterland, Netherlands)**	high		medium	medium		high		medium	yes	yes	yes
Typical features include: - user pay - collection of recyclables - processing of recyclables - backyard composting promoted - collection of yard waste - composting of yard waste - use of specialized collection containers - HHW permanent depots or collection												

15.0 3R SYSTEMS (con't)	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
15.2 Rural Community - Achieving 40% Diversion (e.g. Wiltoo, NH, Rodmann, NY)	high		medium	medium		high		medium	yes	yes	yes
Typical features include: - backyard composting promoted - collection of recyclables or brought to depots by householders - minimal processing of recyclables - high level of interest and support for program - program costs often minimized through volunteer labour											

15.0 3R SYSTEMS (con't)	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
15.3 **Community Achieving 40% Diversion with 3 Stream System**	high		medium	medium		high		medium	yes	yes	yes
Typical features include: - collection of segregated recyclables using designated container - collection of segregated organics using designated container - separate collection of residuals											

15.0	3R SYSTEMS (coo't)	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
15.4	**Community Achieving 40% Diversion with 2 Stream System**	high		medium	medium		high		medium	yes	yes	yes
Typical features include: - collection of segregated dry stream using designated container - collection of segregated wet stream using designated container - no residuals												

16.0 OTHER	Waste Diversion Potential	Cost Effectiveness	Address Needs of Priority Sectors	Degree of Technological Certainty	Environmental Benefit	Unique Aspects or Features	Flexibility/ Adaptability	Influence Consumer Behaviour	Information Available	Applicable to Ontario	Recommendation
a) Design for disassembly by product manufactures to facilitate repair and recycling	high		high	medium	high	high		medium	yes	yes	no
b) Retail product/shelf labelling	medium	medium	high	medium	medium	medium	medium	high	yes	yes	no
c) Computer models for tracking waste generation and diversion programs	medium		medium	medium	high	high	high	low	yes	yes	yes
d) Coating plastic container interior with micro thin coating of glass			high	medium		medium		low	yes	yes	no
e) Reducing waste plastic into molecular components to allow closed loop recycling	medium		high			high		medium	yes	yes	no

Appendix B

Screening Methodologies

SCREENING PROCESS FOR

DEVELOPMENT OF SHORT LIST OF 3R COMPONENTS

1.0 Review the "World" of Solid Waste Management

The first step undertaken by the Project Team was an assessment of available information on solid waste management in order to develop a manageable and useful package of information on 3R components and systems specifically suited to the client's goals and needs. The resources consulted when preparing this bibliography include:

- journals and other publications
- reports
- computer databases
- non-published sources (personal contacts)
- knowledge of Project Team members

Screening of available information was based on inclusive and exclusive criteria which were confirmed during our first meeting with the Task Force:

Initial Inclusive Screening Criteria

- reduction and reuse priorities
- some degree of source separation as a minimum requirement
- non-collection approaches
- collection of recyclables and organic waste
- intermediate handling for recyclables and organic waste
- secondary processing of organic waste

Initial Exclusive Screening Criteria

- incineration/energy from waste
- mixed waste processing
- secondary processing of recyclables
- markets
- technologies and approaches without demonstration or pilot scale facilities

2.0 Collection of Discrete Pieces of Information on 3R Components and Systems

As articles and reports were reviewed, non-published contacts consulted and summary reporting forms completed, discrete pieces of information were produced.

In order to guide us in identifying those items or issues which are most relevant, the Project Team considered a range of issues or questions which are currently being debated or which may be impeding progress in Ontario.

3.0 Development of Bibliography

In order to ensure on-going access to information identified during this initial screening process, an inventory of sources has been compiled in bibliographic format.

4.0 Development of Candidate List of 3R Components and Systems (long list)

The discrete pieces of information were organized into 16 sections, with subsections, by 3R components and systems. This information represents a Candidate List (long list) of approximately 130 alternative components or systems. A number of these items are repeated in similar forms; for example, certain community or householder education programs appear under Source Reduction, Backyard Composting and Management of HHW.

5.0 Development of Recommended List of 3R Components and Systems (short list)

The Candidate List will undergo further screening in order to identify those 3R components and systems which will be subjected to detailed investigation.

It is proposed that the various components on the "long list" be screened down to a Short List of items for detailed investigation based on the following criteria. As information collected during development of the Candidate List is limited and inconsistent, screening criteria have been applied using available data as well as the experience of Project Team members.

Waste Diversion Potential

High	significant contribution to waste diversion goals
Medium	moderate contribution to waste diversion goals
Low	minor contribution to waste diversion goals

Cost Effectiveness

High	anticipated to be lower than the current range of costs
Medium	anticipated to be within the current range of costs
Low	anticipated to be higher than the current range of costs

Address Needs of Priority Sectors

High	suitable for all northern, southern, urban and rural municipalities
Medium	suitable for either northern or southern and either urban or rural municipalities (i.e. 2 or 3 of 4)
Low	suitable for either northern, southern, rural or urban municipalities (i.e. only 1 of 4)

Degree of Technological Certainty

High	proven
Medium	existing
Low	emerging

Environmental Benefit

High	net reduction in environmental impacts
Medium	neutral or minimal environmental impacts
Low	some environmental impact

Unique Aspects or Features

High	highly innovative approach
Medium	novel approach
Low	common approach

Flexibility/Adaptability

High	very flexible and adaptable
Medium	somewhat flexible or adaptable
Low	inflexible, difficult to adapt

Influence Consumer Behaviour

High	likely to educate householder or influence consumer behaviour
Medium	may educate householder or influence consumer behaviour
Low	unlikely to educate householder or influence consumer behaviour

6.0 Project Team Recommendations for Short List

In addition to the application of screening criteria, the Project Team also posed a number of questions:

If selected for the Short List, is sufficient information available to complete the required research?

Is this component, approach or system consistent with Ontario's policies?

Based on ratings and responses to these two questions, the Project Team developed recommendations for items that are considered worthy of consideration by the Task Force for inclusion on the Short List.

Recommendations against inclusion in the Short List have been based on one or more of the following criteria:

- action would be required at the provincial or federal level;
- action would be required by the private sector and is beyond the influence of municipalities; and
- sufficient experience or information currently exists in Ontario.

MUNICIPAL 3Rs INFRASTRUCTURE: A REFERENCE GUIDE

INFORMATION GATHERING METHODOLOGY

1. Allocate items within Project Team.

2. Review information compiled during literature and electronic database search carried out under Phase 1A.

3. Identify municipalities in North America, Europe or elsewhere where the selected activities have been implemented.

4. Identify other sources of information such as trade associations, directories, government agencies and key private sector waste management firms in North America, Europe or elsewhere.

5. Using standard information gathering format, forward information requests on European experiences to ITU.

6. Review identified information sources and municipalities where the selected activities have been implemented within the Working Group to ensure a comprehensive and thorough inquiry.

7. Each Project Team member will initiate contact survey using standard information gathering format for allocated items.

8. Review contact survey information within the Working Group to identify anomalies or other inconsistencies with data.

MUNICIPAL 3Rs INFRASTRUCTURE: A REFERENCE GUIDE

SYSTEM, APPROACH, TECHNOLOGY AND INSTRUMENT PERFORMANCE PARAMETERS

Objectives

It is anticipated that the Municipal 3Rs Infrastructure: A Reference Guide will be used for reference and guidance by municipalities in their efforts to expand and improve their waste reduction programs and activities.

In order to maximize the benefit to users, the Guide must provide key information on each of the items under review. Based on the information presented, each municipal or industry user of the Guide should be able to determine the applicability or potential "performance" of a specific item, given their specific needs and circumstances.

The accompanying table provides a general outline for the information gathering exercise in Phase 2 of the study. However, it is important to note that:

- **information may be unavailable for some areas of inquiry;**
- **information that is available may differ in detail or basis;**
- **investigation into individual items may lead to or suggest additional questions not currently included in the accompanying list.**

Municipal 3Rs Infrastructure: A Reference Guide

System, Approach, Technology and Instrument Performance Parameters

Item	System	Approach	Technology	Instrument
1. General overview				
Description, history, rationale, objectives	X	X	X	X
Relevant socio-demographics of community being reviewed	X	X	X	X
Political/social environment	X	X	X	X
Driving force behind initiative	X	X	X	X
2. Detailed description				
Specific features	X	X	X	X
Waste type(s) and source(s) affected	X	X	X	X
Municipally or privately operated	X	X	X	
If contracted, relevant contractual arrangements	X	X	X	
Role/requirements of resident, private/public sectors	X	X	X	X
Public education/promotion/training	X	X	X	X
Material flow/handling methods	X	X	X	
Residue management	X	X	X	
Key issues in municipal/resident acceptance	X	X	X	X
Applicability to north/south, urban/rural	X	X	X	X
Multi unit applicability	X	X	X	X
Implications for other aspects of waste management system	X	X	X	X

Municipal 3Rs Infrastructure: A Reference Guide

System, Approach, Technology and Instrument Performance Parameters

Item	System	Approach	Technology	Instrument
3. Financing and Economics				
Capital costs	X	X	X	
Operating costs	X	X	X	
Administrative costs (including promotion)	X	X	X	X
Revenues	X		X	X
End market information	X	X	X	
Financing arrangements/issues	X	X	X	X
If contracted, relevant contractual arrangement	X	X	X	
Setting/adjusting rates				X
4. Performance				
Material quantities/capacity	X	X	X	
Cost per standard unit (e.g. tonne, hh)	X	X	X	X
Waste diversion impact (e.g. kg/capita/yr)	X	X	X	X
Observed/measured impact on 3R awareness, participation	X	X	X	X
Capital costs (e.g. per daily tonne of capacity, per capita served)	X	X	X	
Operating costs (e.g. per tonne, per capita served)	X	X	X	
Energy consumption (e.g. per daily tonne of capacity, per capita served)	X	X	X	
Labour requirement (e.g. per daily tonne of capacity, per capita served)	X	X	X	
Net employment impact (e.g. more, less, no change)	X	X	X	X

Municipal 3Rs Infrastructure: A Reference Guide System, Approach, Technology and Instrument Performance Parameters				
Item	System	Approach	Technology	Instrument
5. Design and Siting Requirements/Issues				
Stakeholder involvement	X	X	X	X
Approvals process, timing, costs	X	X	X	X
Environmental issues	X	X	X	X
Conditions of approval	X	X	X	
Reporting requirement	X	X	X	
6. Contacts				
Federal, provincial/state, municipal	X	X	X	X
Non government groups	X	X	X	X
Private sector firms/associations	X	X	X	X
7. Regulatory and Operating Environment				
Government regulations/standards	X	X	X	
Industry standards	X	X	X	

NOTE:

Information may be unavailable for some areas of inquiry.

Information that is available may differ in detail or basis.

Investigation into individual items may lead to or suggest additional questions not currently included in the accompanying list.

Appendix C

Glossary of Terms

SOLID WASTE MANAGEMENT: A GLOSSARY OF TERMS

Aerobic Conditions

A situation in which there is an adequate supply of oxygen available (e.g. a compost heap that is mixed, or turned over, regularly).

Anaerobic Conditions

A situation in which there is an absence of oxygen (e.g. within the well-compacted waste at a landfill site)

Bacteria

Microscopic organisms, some of which cause disease and some of which cause the decay of plant and animal material.

Baling

The mechanical compression of waste or recyclable materials into rectangular bales. Bales are easier to handle, store and transport than loose waste.

Biodegradable Material

Items, or chemicals, capable of being broken down, or decomposed, by natural biological processes, usually involving oxygen, moisture and microorganisms such as bacteria.

Biodegradation

Breaking down, decomposing, decaying or rotting, by natural biological processes. The processes may take a very long time. If the processes occur in bodies of water, they use up valuable oxygen which is needed by the aquatic organisms and often release nutrients which increase the rate of eutrophication.

Blister Package

Packaging which surrounds a product with a transparent plastic bubble mounted onto a cardboard or plastic board. Such packages are said to make the storage and display of the product easier and help reduce shoplifting, but they do not easily lend themselves to recycling.

Blue Box

A blue plastic box used by residents of many municipalities and rural areas to collect and store recyclable items and to carry these items to the curbside /roadside for collection.

Blue Box Materials

The usual materials which are accepted in a community's blue box program (e.g. cans, glass bottles and jars, newspapers). Check your local area because many community programs now also include some types of plastic. It is very important to put only appropriate materials into your blue box. Putting in the wrong items require extra sorting procedures while others render the whole load of materials unsuitable for recycling. The kinds of materials collected in a Blue Box programs are constantly expanding. See *Recyclable Material*.

Boxboard

Stiff paper packaging, often called cardboard, used for cereal, tissue and detergent boxes; not to be confused with corrugated cardboard. Most boxboard has always been made using a certain amount of used paper, such as newspapers. See *Corrugated Cardboard*.

Certificate of Approval (C of A)

A legal document which is required for the operation of any waste management facility under the *Environmental Protection Act*.

Closed-Loop Recycling

Converting used material into material the same as, or similar to, the original (e.g. used newspapers into new newsprint and glass jars into glass bottles).

Commingling

The intentional segregation of recyclable materials from general waste but allowing all recyclables to be mixed together during collection, requiring further sorting at another location. Commingling may save money during collection but the sorting is imperfect and loads of recyclable materials may be contaminated. As a result, the contaminated load of recyclable materials may be unacceptable for a re-processing.

Commingled Materials

A mixture of two or more different types of materials. Technology now exists to recycle selected streams of commingled paper into useful products.

Composite Package

Any package consisting of more than one material; the more materials involved, the more difficult to recycle the package.

Compost

Partially decomposed organic matter which can be added to soil as a source of nutrients and a conditioner. Compost can be produced from kitchen wastes, such as vegetable peelings, and yard waste, such a grass clippings and leaves.

Compostable Material

Anything which is capable of being composted, or biodegraded. All organic materials will biodegrade, but some should be avoided in backyard compost containers. For details, refer to general booklets on this topic or specific instructions which come with commercially available containers.

Conserver Society

A society whose responsible citizens make concerted efforts to reduce consumption of energy and material resources. Conserver citizens also alter their habits in order to reduce the production of waste and other materials which harm the environment.

Consumer Society

A society whose citizens meet their own ever-increasing demands with little regard for the amount of energy or material resources they use up and/or how the environment is degraded by the disposal of their wastes. High consumer demand became a strategic economic goal in many Western countries after World War II and was artificially stimulated through advertising.

Contaminant

A substance, or form of energy, resulting from human activity, which causes an adverse effect on the natural environment, or impairs human use of the environment. Even a naturally-occurring substance can become a 'contaminant' if a human activity causes it to be in an amount or location where it is not wanted (e.g. phosphates, found in many soaps, are essential plant nutrients but cause harm to aquatic ecosystems when their concentration increases quickly and/or over the normal amount).

Corrugated Cardboard

Stiff paper packaging made of two flat layers on the outside and a ridged layer in the middle. Not to be confused with boxboard. Corrugated cardboard is commonly used to make boxes for many products. Old corrugated cardboard is easily recycled into new corrugated cardboard unless coated with wax, heavy paint or contaminated with food waste. See *Boxboard*.

Cullet

Glass that has been intentionally crushed prior to being mixed with other raw materials to make new glass products. The crushing may be done by municipalities or by the companies that actually reprocess the glass.

Curbside/Roadside Recycling

A recycling program in which people separate recyclable materials from general waste and place them at the curbside/roadside for collection.

De-Inking

A chemical process which removes ink from recyclable paper. Often harmful wastes are produced. Recycling paper materials does not always include de-inking.

Disposal Facility

A facility or a part of a facility where waste is placed and where it will remain after closure. Landfills and lakefills are examples of disposal facilities.

Disposable Product

Something designed to be thrown away after one, or just a few, uses.

Diversion

Using the 3Rs of waste management as part of a strategy to keep materials from going to disposal.

Domestic Waste

See *Residential Waste*.

Drink(ing) Boxes

Aseptic containers designed for convenient transportation and long-term storage of liquids such as fruit juices. They are an example of a composite package, consisting of paper, plastic and metal foil and are not suitable for closed-loop recycling. Some plastic recycling processors will accept a certain limited percentage of these containers with other mixed plastics.

Energy From Waste (EFW)

The concept of burning waste in an incinerator and using the released energy to make steam or to generate electricity which could be used in a variety of ways (e.g. to heat buildings). See *Incinerator*.

Environment

The *Environmental Assessment Act* defines the environment as: (i) air, land or water; (ii) plant and animal life, including man; (iii) the social, economic and cultural conditions that influence the life of man or a community, (iv) an building, structure, machine or other device or thing made by man; (v) any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from the activities of man; or (vi) any part or combination or the foregoing and the inter-relationships between any two or more of them in Ontario.

Environmental Assessment (EA)

A detailed environmental study of a proposed project. The study includes an assessment of the need for the project, various alternatives to the project, potential social and environmental impacts, methods to reduce the potential for any negative effects, methods to remediate any problems which do occur, and monitoring techniques and frequency.

Fertilizer

Material, natural or synthetic, used to add nutrients to soil. Most chemical fertilizers contain a mixture of nitrogen, phosphorus, and potassium.

Fine Paper

Good quality paper such as that used for photocopiers, computers, legal documents and writing; has long cellulose fibres.

Garbage

A used material people no longer want and for which they can find no further uses. Also called: rubbish, refuse, residual (waste), and trash. Whatever its called, garbage is something we classify as such by putting in a container for collection and disposal. Unfortunately, much of what we call garbage often contains many items which are reusable or recyclable. See *Municipal Solid Waste*.

Hazardous Materials

Things which are potentially harmful to living organisms because they are corrosive, inflammable, reactive or toxic. These items are not usually included with municipal solid waste.

Heavy Metals

A group of metals including aluminum, zinc, chromium, nickel, copper, tin, silver, antimony, cadmium, arsenic, lead, mercury, iron and cobalt. These materials tend to bioaccumulate and also follow contaminant pathways through an ecosystem's food web. Heavy metals are often present in the bottom ash of incinerators and the leachate from landfill sites.

Humus

Nutrient-rich material resulting from the natural decay of organic material in the soil; similar to compost.

IC&I Waste

Industrial, commercial and institutional solid waste generated by businesses and industries (including shopping centres, restaurants and offices) and institutions (such as schools, hospitals and government offices). IC&I wastes make up about 60% of Ontario's total municipal solid waste.

Incinerator

Facility for the burning of material, often garbage. Reduction in the volume of the material varies with the material being burned. Incinerators produce a residue, or bottom ash, which presents a disposal problem, and various gases and particulates, or fly ash, which should not be released into the atmosphere. See *Energy from Waste*.

Industrial, Commercial and Institutional (IC&I) Waste

Solid waste generated by industries and businesses of all types, including shopping stores, restaurants, and offices; and institutional types of establishments, such as schools, hospitals, government offices, and universities. IC&I waste makes up about 60 per cent of Ontario's total municipal solid waste stream. See *Municipal Solid Waste; Residential Waste*;

Junk Mail
Slang term that covers a broad range of print advertising. Some examples include: coupons, flyers, free samples and brochures.

Landfill Site

An area of land used for the burial of wastes under controlled conditions. Often called a "sanitary landfill site." Landfilling involves the compaction of waste in sections, called "cells." The cells of waste are covered with soil at regular intervals. A properly designed landfill site includes plans for, site preparation, leachate and biogas control, final capping, site rehabilitation, final use, and perpetual monitoring.

Leachate

The liquid which results when rain or melting snow percolates through a material and carries with it dissolved materials picked up as it moves. Depending on the location, leachate may contain hazardous materials which could contaminate groundwater or surface water. Leachate has more heavy metals if the rain or snow is acidic.

Life Cycle Analysis

A way of determining the total amount resource and energy used and waste generated by a particular product at all stages of its development: from the resources extracted to make it, through to its manufacture in a factory, its sale in a store, its use by a consumer, the materials extracted from it to make new products, and its final disposal. Lifecycle analysis is still a relatively new science. It helps to compare the relative environmental impact of two or more types of products and packaging.

Litter

Large or small quantities of unwanted waste carelessly left lying around. Anti-litter campaigns do make our streets and parks look better but do not contribute to an actual reduction of solid waste going to disposal.

Low-Grade Paper

Paper which contains short cellulose fibres, has been chemically treated or had a special coating applied (e.g. newsprint, fax paper, boxboard and magazines); often of less value for recycling. See *Fine Paper*.

Material Recovery Facility (MRF)

A facility where specified materials are intentionally removed from mixed waste or where co-mingled recyclables are sorted into distinct categories.

Methane

A naturally-occurring gas produced when organic material biodegrades without the presence of sufficient oxygen. It is often mixed with other gases. Because methane is smelly, flammable and can migrate through soil, it can cause problems at landfill sites or in the surrounding area. It can be collected and used for the generation of heat and electricity.

Microorganisms

Living things which can only be seen with the aid of a microscope or magnifying glass (e.g. bacteria).

Monitoring

The detection by various means of any existing or potential environmental problems created by a waste site, usually over a long period of time. In landfills, for example, perpetual monitoring is necessary to be sure that the gas collection system is functioning properly and the liner is not leaking.

Municipal Solid Waste (MSW)

More commonly referred to as garbage, this waste material is handled by municipal collection and/or disposal services. It includes two main types of solid waste: residential, or domestic, waste and industrial, commercial and institutional waste. Municipal solid waste does not include hazardous and liquid industrial wastes. Also known as garbage, refuse, rubbish and trash. Different municipalities make legal distinctions among these terms, but they are all forms of municipal solid waste. See *Industrial, Commercial and Institutional Waste; Residential Waste*.

Newsprint

Grade of paper, combining high percentages of groundwood pulp, made especially for use in the printing of newspapers.

Non-Renewable Resources

Materials that cannot be replaced by nature once they have been used (e.g. coal, oil and natural gas). Metals are also non-renewable, but these can be recycled.

Not-In-My-Backyard (NIMBY)

A label often given to people who oppose the siting of waste disposal facility in their local communities. The concept of NIMBY has been much abused to include people with legitimate concerns about the environmental impact of a waste disposal facility.

Organic Material

Substances originating from living things and containing carbon (e.g. potatoes, meat, oil and plastic).

Over-Packaging

Unnecessary extra layers of packaging. See *Packaging*.

pH Scale

Used to measure of the acidity or alkalinity of a material. The scale ranges from 0 (very acidic) to 14 (very alkaline). Each unit on the scale represents a factor of 10 because the scale is logarithmic (i.e. pH=4 is 10 times more acidic than pH=5 and pH=3 is 100 times more acidic than pH=5). Something with a pH=7 is neutral (neither acidic nor alkaline). For example, lemon juice is acidic, while baking soda is alkaline.

Packaging

The wrapping, container or packing material used to enclose a product. For every product, there is a list of reasons why packaging is considered to be required, ranging from protecting breakable items to providing an advertising vehicle. In some cases, there are legal packaging requirements (e.g. for making the item tamper-proof or providing ingredient lists or instructions in both official languages). Some reasons for packaging are considered more valid than others. Each situation should be judged individually. Although safety is a critical factor, the effects on the environment of both production and disposal of the package must also be considered.

Pathogen

Organism capable of causing a disease.

Photodegradable Material

Material which is capable of being broken down in the presence of ultraviolet (UV) radiation from the sun or artificial sources. Most plastics are photodegradable and require the addition of UV inhibitors if they are to be used outdoors (e.g. road signs).

Plastics

A very large number of different, synthetic, organic compounds, usually made from products of the oil/petroleum industry. Different plastics have a great variety of properties and, thus, have many kinds of applications. Because there are so many kinds of plastics, it is often difficult to include them in community recycling programs.

Pollutant

See *Contaminant.*

Pollution

The release of contaminants into the environment. Pollution abatement is the removal of contaminants from emissions or effluent before they are released into the environment. Even better than pollution abatement is pollution prevention which involves changing industrial processes/activities to ensure that they do not create contaminants in the first place.

Polluter Pays

When applied to waste management: The idea that the person or persons responsible for generating wastes are responsible for bearing the costs of their management; and equally, they are responsible for bearing the cost of cleaning up the environment. See *Cradle-to-Grave Management; Orphan Sites; Product Stewardship; True-Cost Accounting; Waste Generator.*

Polychlorinated Biphenyls (PCBs)

A group of very stable organic compounds. PCBs had a variety of uses, mostly as electrical insulating fluids, until the mid-1970s, when they were banned for use in Canada. PCBs have been found in human tissues, rainwater, and many species of birds and fish. They have a tendency to collect in fatty tissue, degrade gradually, and to accumulate in the food chain (bioaccumulation). PCBs have been associated with various reproductive disorders in birds. In Ontario, anything containing PCBs is considered to be a hazardous material.

Polyethylene Terephthalate (PET)

A lightweight, strong, transparent plastic; used to make large carbonated, soft drink bottles.

Polystyrene (PS)

A plastic used to make clothes hangers, rulers and various containers. Polystyrene can be foamed to make drinking cups, plates, fast food containers and pellets or moulded for packing breakable materials. Originally made using CFCs and HCFCs, foamed polystyrene is now made using pentane, carbon dioxide

or other gases as the foaming agent. *Styrofoam* is the commonly-used brand name of a blue-coloured foamed polystyrene rigid insulation.

Post-Commercial Waste

Materials remaining at the end of any manufacturing process which are returned to that process to make more products (e.g. trimmings and cuttings at a pulp and paper mill).

Post-Consumer Waste

Materials previously used by consumers at various locations, such as homes, offices, stores and institutions, and collected for recycling (e.g. cardboard boxes, photocopies, old notebooks, glass bottles, cans).

Product Stewardship

An approach to waste management which recognizes the responsibility of a product or packaging manufacturer to control/monitor the manufacture, shipment, storage, use and final disposal of any product. See *Polluter Pays*.

3Rs of Waste Management

Reduce, reuse and recycle - in that order - before disposal! A major goal of municipal waste management is to keep materials out of the waste disposal stream. The 3Rs form a hierarchy of actions to achieve that goal:

- First, encourage people to reduce at source the amount of products or packaging purchased, consumed or used;
- Second, encourage people to buy reusable products or packaging and to reuse the products or packaging as often and as much as possible; and then,
- Third, encourage people to participate in recycling programs.

The remaining material after the 3Rs are considered "residual waste." Note that it is wasteful to recycle a refillable and re-usable container.

Reclaim

To recover, or regain possession of, something in order to use it again.

Recyclable Material

A material which can be recycled. Not to be confused with 'reusable'. Technically, most materials can be recycled; however there are not necessarily programs set up to separate, collect and process all recyclable materials. The term 'recyclable' is relatively meaningless unless a program exists to collect, reprocess and market the end-product. See *Mobius Loop*.

Recycling

Physically, chemically or biologically reprocessing something in order to use the material to make a new product. A recycling program involves much more than just the actual reprocessing. It involves also the continuous separation, collection and/or cleaning of the recyclable materials and the maintenance of stable markets for the recyclable materials and useful final end-products. See *Closed-Loop Recycling and Secondary Recycling*.

Recycled Content

The percentage of the product or package which is made of recycled materials. See Mobius Loop; Post-Commercial waste; and Post-Consumer Waste.

Recycling Depot

A facility for the temporary storage of recyclable materials. In some areas, depots are used as drop-off locations by the public. In other areas, they are used by municipalities to store materials collected by trucks.

Recycling Plant

Facility to which recyclable materials are taken to be reprocessed.

Reduction

The decrease in the quantity of waste produced through modified consumer practices and industrial production changes to generate fewer useless by-products. See *3Rs of Waste Management*.

Refillable Container

A container which can be cleaned and filled several times after being used with the same or similar product (e.g. carbonated soft drink and Ontario beer bottles). Usually the refilling is done by the companies making the products.

Refuse-Derived Fuel (RDF)

Fuel made from processed garbage; often pelletized.

Refuse-Fired Steam Plant

Facility which generates steam using the energy released by the incineration of garbage.

Reject

To refuse to buy or accept a product or type of packaging because it is wasteful. Often referred to as an activity within reduction - the first "R" of the 3Rs of waste management.

Remediation

Taking corrective measures at a site causing environmental problems.

Renewable Resources

Resources which can be replenished by nature after being extracted or used by humans. Trees are often called a renewable resource; so is water, fish and wild game. In reality, however, these resources are renewable only to the extent that the rate of their extraction or use is less than the rate at which they are replenished by nature. Sometimes used in the same context as "renewable energy." See *Non-Renewable Resources*.

Repair

To mend, or put into good condition, something which can then be reused instead of being thrown away. Often referred to as an activity within reuse - the second "R" of the 3Rs of waste management.

Residential Waste

Waste produced by all types of households, including detached dwellings, row housing, condominiums and apartments. In Ontario, residential waste makes up about 40 per cent of the total municipal solid waste stream. See *Municipal Solid Waste*.

Residual Waste

The materials remaining after all efforts have been made to reduce, reuse and recycle. Usually, these materials have to be put in approved landfill sites. Only residual waste is properly referred to as "garbage." See *Garbage*.

Resource Recovery

Any process that extracts value from collected solid waste - for example, through recycling or burning waste as fuel to generate energy.

Returnable Container

Container which can be taken back to a specific location, often a store. In return, a person receives a refund of a deposit paid when product was originally purchased. Returnable containers are sometimes refilled (e.g. carbonated soft drink bottles); others are recycled (e.g. beer cans).

Reusable Product

Something which can be used again for the same, similar or different purpose. Reusing some items for craft purposes can give the items a second life prior to being discarded; provided that the items are not a refillable container/returnable containers or if recyclable, that they are not used in ways which prevents them from being collected by in a recycling program.

Reuse

To use something again in its original form for the same or different purpose. See *3Rs of Waste Management.*

Risk Assessment

When applied to waste management: a way of measuring the significance of a waste problem for its impact on the environment or human health. Risk assessment is a relatively new and controversial field of study. There is often disagreement on how the environmental or health risk of a waste or waste disposal facility is to be measured.

Secondary Recycling

Recycling which makes entirely different products out of the reprocessed materials (e.g. making egg cartons from used newspapers; making a filler for asphalt from glass bottles; making a wood substitute from mixed plastics). These process are not as efficient as primary recycling but are definitely better than landfilling the materials.

Shredding

Using various machines to reduce the size of waste materials in order to facilitate their reprocessing and /or disposal.

Soil Conditioner

Material useful when added to soils because of its nutrient content and/or its water-draining or water-holding properties. See *Compost*.

Solid Waste

See *Municipal Solid Waste*.

Solid Waste Management

The process of collecting, sorting, processing, recycling, reclaiming and disposing of waste. The waste management hierarchy first considers waste reduction and reuse measures, followed by recycling and resource recovery and finally disposal.

Source Separation

The purposeful segregation of used materials from municipal waste into specific material categories at the point of generation, or where the waste is created. The generator may separate recyclables from other waste, but further sorting is required. Some municipalities further sort recyclables into separate compartments in the collecting trucks; others co-mingle the recyclables for sorting at another location. Curbside sorting is much more efficient, and the materials are much more marketable because they have less contaminants.

Styrofoam

Trademark name for a specific type of foamed polystyrene used as rigid building insulation. There is no such thing as a "styrofoam" cup. See *Polystyrene*.

Tipping Fee

The amount of money charged by the operator of an approved waste disposal facility for receiving and managing waste. The charge is based on either the weight or volume of the waste. Often a tipping fee is higher than the actual operating costs of the facility, so that the extra funds can be used by a municipality for its 3Rs programs.

Transfer Station

Facility used to receive, sort and temporarily store wastes and/or recyclable materials until they are shipped to another site for reprocessing or disposal.

True-Cost Accounting

Recording all the costs - including the environmental and social costs - of managing the waste generated from the use of a particular product or packaging. Also known as "full-cost accounting," the sum total of all costs is usually what we as a society have to pay for the management of waste. Unfortunately, these costs are often not evident in the price of a product or a service. See *Polluter Pays*.

Toxic Substances

Materials, solid, liquid or gaseous, which are harmful, or poisonous. They are sometimes called 'toxics'; not to be confused with 'toxins'.

Toxins

Harmful, or poisonous, substances created in, or by, living organisms, such as bacteria' They form a sub-group of 'toxic substances'.

Transfer Station

Facility used to receive and temporarily store waste and/or recyclable materials until they are shipped to another site for reprocessing or disposal.

Vermicomposting

Composting using worms to digest the organic materials provided; can be done indoors. For details, refer to specific instructions/suggestions.

Waste

Solid, liquid or gaseous materials left over after various processes in homes, schools, businesses, institutions and industries. Unwanted materials, previously thought to be useless, often are carelessly released into the environment. Many of the materials can be reused, recycled or not produced in the first place.

Waste Disposal

Placing waste for long-term storage in a landfill site or in an incinerator for partial destruction. Waste disposal facilities must be certified for use. Their purpose is to keep the waste from entering into the environment.

Waste Diversion

Using the 3Rs of waste management as part of a strategy to keep used materials from going to disposal. See *3Rs of Waste Management*.

Waste Generator

The person, business, institution or industry which has created waste materials.

Waste Management

The management of waste and used materials through the 3Rs and disposal. Proper waste management puts first emphasis on waste reduction, reuse and recycling, before disposal methods are used. See *3Rs of Waste Management; Waste Disposal*.

Waste Management Master Plan

A long-term plan for the design and implementation of a waste management system to service the waste needs of a particular area.

Waste Management System

All the facilities, buildings and equipment used for the collection, treatment and disposal of wastes, and for the reduction of used materials going to disposal. A complete waste management system consists of disposal and diversion components. A waste management system is defined for a particular "service area," which is the population living in one or more municipalities.

Waste Reduction Work Plan

A waste reduction work plan is an organized plan to divert waste from disposal. The plan includes a description of activities, timelines, responsible parties and expected results.

Wet/Dry Recycling

A program which involves the collection of both the regular dry recyclables, such as cans and bottles, and wet compostables, such as kitchen wastes.

SOME COMMONLY USED ABBREVIATIONS

C of A	Certificate of Approval
EFW	Energy From Waste
EA	Environmental Assessment
EAA	*Environmental Assessment Act*
EPA	*Environmental Protection Act*
HHW	Household hazardous waste
IC&I	Industrial, Commercial and Institutional
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
NIMBY	"Not In My Backyard"
OCC	Old Corrugated Cardboard
ONP	Old Newsprint
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated biphenyls
PET	Polyethylene terephthalate
PS	Polystyrene
3Rs	Reduce, Reuse, Recycle
RDF	Refuse-Derived Fuel

Appendix D

Foreign Exchange Conversion Factors Used In Preparation Of This Guide

FOREIGN EXCHANGE CONVERSION FACTORS USED IN PREPARATION OF THIS GUIDE

As of May 31, 1993

COUNTRY	PER CANADIAN $
U.S Dollar	0.7865
Deutschemark	1.2498
Japanese Yen	84.100
U.K. Pound	0.5046
French Franc	4.2220
Swiss Franc	1.1170
Belgium Franc	0.0390